

Intestinal Parasites and "Progress": A case study from Urabá antioquia (Colombia)

Jaime Carmona Fonseca, MD, MSc., Eliana María Arango Flórez, MSc., PhD.

Abstract

Background: Infections with intestinal parasites in humans can be analyzed using the model of disease and illness as ongoing processes. The presence, persistence, and dissemination of intestinal parasites are determined by the living conditions prevalent in societies and by differences related to social class. There is a paucity of both international and national studies examining the relationship between living conditions and the prevalence of human parasites in Colombia. There are even fewer studies that adopt a historical approach to this relationship.

Objectives: a) compare current data on the prevalence of intestinal parasites in Urabá (a subregion of the Antioquia Department in Northwestern Colombia) with data collected

50 to 75 years ago; b) explore the relationship between prevalence of intestinal parasites and living conditions during these time periods.

Methodology: A literature review was performed to characterize living conditions and prevalence of intestinal parasites during the two periods of interest (contemporary statistics and those from 50-75 years ago).

Results: Both study periods were characterized by a high prevalence of intestinal parasites and substandard living conditions.

Conclusions: With respect to human parasites and living conditions, little has changed in Urabá in the last 50 years. Economic progress has benefited the few, while social progress has yet to touch the vast majority of people in Urabá.

Corresponding Author:

Dr. Jaime Carmona Fonseca, Professor
Affiliation: Universidad de Antioquia
Email: jaimecarmonaf@hotmail.com

Eliana María Arango Florez, MSc., PhD.
Title: Junior Researcher
Affiliation: Universidad de Antioquia
Email: emarango@gmail.com

Submitted: 11/16/2016
Revised: 4/27/2017
Accepted: 4/27/2017

Peer reviewed: Yes
Conflicts of Interest: None declared

Introduction

The existence of human intestinal parasites is determined by economic and social processes. As a consequence, the presence, persistence, and dissemination of intestinal parasites serve as an indicator of both socioeconomic and environmental conditions. (1-4) Thus, intestinal parasites in humans offer a concrete example of health and disease as a process. Intestinal parasites provide a window into prevailing health inequalities. (5, 6)

Socioeconomic conditions include such indicators as: familial economic poverty and malnutrition, cultural characteristics, fecal soil and food contamination, water pollution, inadequate hygienic habits, lack of education, and deficient environmental sanitation. Natural environmental conditions such as temperature, humidity, and soil conditions also play a role; they can increase the viability and maturation of the infectious stages of geohelminths. (3, 4, 7, 8) Because of these factors, the prevalence of intestinal parasites is considered an indicator of community-level socioeconomic development.

Intestinal parasites are no longer limited to rural areas. Today, "abnormal" neighborhoods (tugurios, favelas, villas-miseria, barrios bajos, barrios marginales, barrios de invasión, etc.) of the medium and large cities of what hegemonic discourse considers to be "developing countries" provide the appropriate sanitary conditions for the preservation or intensification of the transmission of geohelminths and intestinal protozoa. (9-18) As a result, even in urban settings parasites reflect community socioeconomic development (19, 20); the endemic status of these parasites is closely related to the living conditions of various social classes and groups. (2, 5, 21-23)

Co-infection with multiple parasites (e.g. intestinal, hematologic, etc.) is common in countries such as Colombia and in many parts of the Amazon Basin, Africa, and Asia. (24-26) As a general rule patients with intestinal parasites also suffer from chronic protein-caloric malnutrition. This problem is particularly severe for the young (those under 15 years) and for pregnant women. (27-29) In the area of this study (Urabá, Altos Sinú and San Jorge, and Bajo Cauca, hereafter The Region) chronic malnutrition and intestinal diseases facilitate

infection with malaria; once again, this is a particular risk for the young and for pregnant women.

Chronic malnutrition produces immune suppression favoring diseases such as intestinal parasites and malaria. These diseases in turn aggravate pre-existing malnutrition. These problems coexist and are mutually reinforcing, thus increasing the severity and mortality of the individual diseases. (30-34) The effects of intestinal nematodes on nutritional status are well known, as are the effects of malnutrition on gastrointestinal nematode infection. (30, 31, 33, 35). This reinforcing dialectic of malnutrition and infection is quite common (4, 21-23, 28, 36-38) in areas such as The Region, which is responsible for over 60% of Colombian malaria cases; The Region also supplies at least 90% of malaria cases in the departments of Antioquia and Cordoba. (36, 37)

The worst living conditions are to be found in rural areas, among those living outside of urban centers. Nevertheless, in countries such as Colombia and in almost all of Latin America and the Caribbean, hundreds of thousands, even millions of people live in so-called "abnormal" neighborhoods, places in which living conditions are generally worse than those of rural areas.

It is widely accepted that the prevalence of human intestinal parasites is an indicator of community socioeconomic development. Higher rates of intestinal parasites are associated with a lower social and economic well-being of the population and substandard living conditions. (19, 20) We undertook this study to explore what we could learn about rural living conditions by studying the prevalence of intestinal parasites. Has there been any improvement if we compare today's rural communities with those of 40 or 50 years ago? Has

there been any improvement in living conditions as reflected in levels of intestinal parasites? To answer these questions, we undertook an investigation whose objective was to estimate the prevalence of intestinal parasites in the population of children under 15 years old, living in various rural subdivisions (veredas) of the village of El Tres in the Turbo municipality located in the Urabá zone in the Department of Antioquia. We used data on the prevalence of intestinal parasites and additional information on rural living conditions to answer these questions.

Materials and Methods

We conducted a literature review using both library documents and the internet to find information on the prevalence of intestinal parasites in Urabá 45-50 years ago. We also sought information on living conditions during this period in Urabá.

The current prevalence of intestinal parasites was measured through nutritional and parasitological surveys published previously. (4, 39, 40)

The technical aspects of the study have been presented and discussed in other reports (4,40-41). The procedures and techniques used for the examination of intestinal parasites made it possible to detect pathogens in 83% of the sample.

Research Setting

The research was carried out in the urban and rural areas of El Tres, a municipal subdivision containing three neighborhoods. El Tres itself is a rural subdivision of Turbo (Urabá, Department of Antioquia). (41) The Municipal Health Secretary estimated the 2014 population at 10,000 inhabitants; of these 3,300 were children under the age of 15. The majority of the

population lives in rural areas. A previous survey had estimated the prevalence of intestinal parasites in Turbo children at 80%. (4, 40) We had determined that the sample size (for the pediatric survey) was 229. However, taking into account the availability of resources and our desire to fully explore the socio-economic and cultural context, we ended up with a sample of 1,600 children representing about 48% of the entire pediatric population. Sampling was done randomly using the municipal census. Families who refused to participate were not replaced.

Ethical Aspects

This study was approved by the Institute of Medical Research, University of Antioquia.

Results and Discussion

A. Current prevalence based on 2012 nutritional and intestinal survey.

Current prevalence of intestinal parasites was determined by a parasitological and nutritional survey conducted in 2012. The 2012 sample included 1600 children; 815 (51%) were girls.

304 (19%) of the sample came from urban areas; the remainder (1,296) were from rural areas. 55 children did not provide fecal samples (or had deteriorated samples). This left us with 1,545 usable fecal samples. There were no significant differences between girls and boys in terms of age distribution, rural versus urban residence, and local neighborhood ($p(X^2) > 0.05$). The average age was 6.7 years, the average weight was 20.9 kg, and the average height was 110.4 cm. Chronic malnutrition was evaluated using height for age and was diagnosed as present if the value was less than two standard deviations from the mean. 25% of the children

Age (years)	Prevalence
< 1	3/70 (1%)
1-4	154/547 (39%)
5-9	126/582 (32%)
10-14	112/392 (28%)
All ages	395/1591 (25%) (95% CI: 23-27%)

met criteria for chronic malnutrition. (see tables 1-2)

B. Prevalence of pathogenic intestinal parasites

The overall prevalence of pathogenic intestinal parasites (PIP) was 87% (95% CI 85-89%). There were protozoa in 63% (61-65%) of samples and helminths in 69% (67-71%). Protozoa and helminths showed significant association ($p (X^2) = 0.005$): 13% lacked both and 69% presented both. PIPs were found in 5% of children under one year of age. The highest prevalence of PIP was between 2 and 7 years. The cumulative frequency of PIP suggests that by the age of 5 years 50% of children are infected, i.e, the cumulative prevalence of PIP in children between <1 to 5 years old is 50%.

The prevalence by species of PIP was:

- *Entamoeba histolytica* / *E. dispar*: 22% (20-24%)
- *Giardia lamblia*: 34% (32-36%)
- Both protozoa: 8% (125/1545)

At least one of seven helminths (*Ascaris lumbricoides*, *Trichuris trichiura*, *Necator americanus*, *Ancylostoma duodenale*, *Strongyloides stercoralis*, *Enterobius*

Retinol	
Reference value: >20 µg/dL	
< 7 years	25.1 µg/dL
≥ 7 years	27.8 µg/dL
Entire Sample	26.2 µg/dL (SD ±9.3)
Ferritin	
Reference value without infection: <12 µg/L Reference value with infection: <30 µg/L	
Entire sample	26.82 µg/L (SD ± 21.8)
C Reactive Protein (CRP)	
Reference value <8mg/L	
Entire sample	3.1 mg/L (SD ±9.1)
Leukocytes	
Reference value: 4,800 - 10,000/µL	
Entire sample	10,700 ±3,800/µL
Cyanomethemoglobin	
Age in years (reference level)	Mean values (±SD)
< 7 years (≥ 11g/dL)	10.6 g/dL
≥ 7 years (≥ 12g/dL)	11.5 g/dL
All Ages	10.99±1.38 g/dL

vermicularis, *Hymenolepis diminuta*, *H. nana*) were found in 69% (1,072/1,545) of children. The prevalence of helminths, according to the species was:

- *S. stercoralis* 7% (6-8%)
- *N. americanus* / *A. duodenale* 29% (27-31%)
- *A. lumbricoides* 45% (43-47%)
- *T. trichiura* 45% (43-47%)

Multiple infections with protozoa were relatively rare (8%) but co-infections with helminths were common (45% to 68%).

C. Historical Data on Parasites

1940: Roughly 75 years ago, Luis Patiño Camargo assembled available national data on parasites in Colombia. He made prevalence estimates based on averages provided by several different investigators and laboratories; these averages in turn were based on tens of thousands of coprograms from people in both urban and rural areas. He estimated prevalences of:

- *A. lumbricoides* (80%)
- *T. trichiura* (81%)
- *N. americanus/A. duodenale* (88%)
- *E. histolytica/E. dispar* (9%)
- *G. lamblia*¹ (4.5%). (42)

1965: By 1965, it was estimated that 80% of the Colombian population was infected with PIP; in children aged 1-4 years, the frequency was 83%, and in those aged 5-14 years 90%. (13) In summary, 87% of children had intestinal parasites.

1965-1970: In April 2016 we found unpublished data from the archives of the Parasitology Lab, Department of Microbiology and Parasitology, Faculty of Medicine, University of Antioquia. This data was derived from field studies carried out by faculty, laboratory technicians, and medical students as part of the parasitology courses held from 1965 to 1970. This data indicate the following prevalences of PIP:

- *T. trichiura*: 82%
- *Ascaris lumbricoides*: 76%
- *N. americanus / A. duodenale*: 58%²
- *S. stercoralis*: 11%
- *E. histolytica / E. dispar*: 42%
- *G. lamblia*: 8%

¹ Data from Bogota only.

² 72% of persons were infected by at least one of these three.

In comparison with our 2012 data it seems that the situation has worsened; pathogenic intestinal parasites now affect 87% of those studied.

1965-1980: David Botero Ramos stated in 1990 that in 1965-1966 period, 88% of the population had intestinal parasites. Ten years later (1977-1980) national prevalence was 82%. He wrote: "The unfavorable environmental conditions in both the countryside and the urban slums, specifically fecal soil contamination, have changed little in the last 14 years." In marginalized areas, the lack of hygiene and education had not been addressed. (46)

Botero Ramos employed a somewhat vague terminology and never clearly defined terms such as "unfavorable environmental conditions," "unprotected sectors", etc. Despite this, one senses in his writing that he is trying to discuss socially marginalized classes who were exploited economically by the wealthier classes.

The same problem arises with the authors of "Observations on human helminthiasis in the Colombian soil." Their description of social processes was rather primitive. They remark, for example, that "the unprivileged sectors of the population retain patterns and social practices that are perpetuated from generation to generation." Yet they never explain what they mean by "privileged" and why privilege might be important. They neither explain or understand why preserving traditions and social practices perpetuated from generation to generation is a process that occurs in all societies and social classes, including those formed by "the confederacy of the well-off." (47)

1979: In 1979, the Antioquia Health Service produced a report on "Diseases related to environmental fecal contamination." In Urabá 4% of the population was infected with intestinal parasites, while the prevalence was only 2 percent in the Valley of Aburrá. These figures were derived from two public health forms. (43)

The authors of the report engaged in serious self-criticism. They noted that these rates (similar to those of other regions) were very low. They attributed this to underreporting, noting that it was absurd to accept data that showed higher rates of parasites in urban areas. "The best we can suggest is that these infections are under-reported and that the reality is probably 5 to 6 times what we seen in the reports." (43) We would note that of the 49,351 samples reported 69.6% showed parasites.

The authors concluded with the following: "We prepared this report to call attention - yet one more time - to a problem that is evident to everyone and yet remains unaddressed. We know how to solve it: environmental sanitation, potable water, proper removal of fecal matter, drainage, and garbage services. (43)

2009: Our data on protozoa prevalence are similar to those reported in 2009 from an Antioquia-wide study of 2,754 children. The subjects were aged 8 months to 6 years, and were enrolled in a supplemental food program. Prevalence rates in this group were 27.6 % for *G. lamblia* and 24.6% for *E. histolytica*. In this study, samples were preserved 7-20 days with 10% formaldehyde. (10) In contrast to our study, the investigators found rates of helminth infection that were 1/3 to 1/2 of what we had found.

D. Living conditions in Urabá now and then

Living conditions are not simple, independent variables which exist outside of a social context composed of individuals and classes. in permanent interaction and transformation. This is, however, the way that practitioners of empirical-positivist epidemiology understand them.

Following the approach taken by Latin American Social Medicine, we think of living conditions as the material conditions in which individuals and families go about the activities of their daily life. Thus, they are determined by larger social dynamics and mediated by processes of social reproduction. Health and disease are not static states, but rather elements of a dynamic and dialectical process with a historical character. A complete analysis needs to take into account different explanatory levels, interrelationships, and the role of social determination. (2, 5, 44, 45) Tables 3 & 4 offer a tabular summary of our findings.

Unmet Human Needs: Twenty-two percent of households in Antioquia had unmet basic needs in 2008; 22% of those living in the municipal seat and 45% of those in the rest of the Department. In Urabá, 53% of households had unsatisfied basic needs (municipal seat: 37%, rest: 76%) and in Turbo the level of unmet needs is 67%% (municipal seat: 57%, rest: 74%). The percentage of families with unmet basic needs varied between 27% in Aparatadó and 97% in Murindó. In 1999 illiteracy in Turbo was 18%, which is nearly double the Departmental average of 8%. (48)

Quality of life indicators can allow us to determine the degree of poverty in a community. They also allow us to rank regions by levels of poverty and to compare them with departmental averages. (49) Urabá is the subregion of Antioquia with the highest percentages of poverty

Table 3: Prevalence of Intestinal Parasites in El Tres, Turbo and other parts of Urabá					
during two periods: 1940-1980 & 1996-2012					
Location	Historical Period	Prevalence of Infection	Location	Current Status	Prevalence of Infection
Colombia	1940	<i>E. histolytica</i> / <i>E. dispar</i> : 9% Helminths: 83% Source: (42)	Turbo and El Bagre	2006	AL 44%, TT 62%, UN38% Source: (38)
Colombia	1965	80 children (age 1-14): 87% infected Source: (13)	Antioquia and Urabá	2006	Children up to age 6 Protozoans: 26%, Helminths: AL 17%, TT 23%, UN6% Source: (10)
Colombia	1977-1980	82% Source: (46)	El Tres, Turbo	2009-2010	Minimum 87% Protozoans: 63% Helminths: 69% Source: (4, 39, 40)
Several rural municipalities in Urabá	1968-1969	AL, TT & UN: 72% (average) Amebas: 42% GL: 8% (Archival Data)	Turbo	2009-2010	80% Source: (21)

Notes: AL *A. lumbricoides*; TT *T. trichuria*; UN uncinarias; *N. americanus*/*A. duodenale*: EH *E. histolytica*/*E. dispar*; GL: *G. lamblia*.

and extreme poverty. There are also inequities in terms of unmet needs both within the Department and among the different subregions. (50)

The numbers are clear: The latest survey of quality of life shows that 50 percent of Antioquia's inhabitants live in poverty and 3.9 % in extreme poverty. Almost 19% of Antioquians live in conditions of unmet basic needs; these includes factors such as inadequate housing, lack of public services, critical levels of overcrowding, and high rates of truancy and economic dependence. (51)

A study carried out by Universidad del Valle, in 1997-1998, noted that Turbo was the first municipality to develop the banana and plantain industry. Despite this, none of the income generated by the banana companies made the slightest impact on living conditions in

Turbo. On the contrary poverty rates in Turbo are at critical levels. A high percentage of the population belongs to stratas 1 and 2; these indicate extreme poverty and high rates of unmet basic needs. The result is a population vulnerable to deficiency diseases. The lack of basic sanitation and overcrowded housing represent a challenge to the population's physical health. These are some of the social problems arising from coexistence in hostile, crowded environments. (48)

Research originating from NACER (a research group at the University of Antioquia which collaborates with CLAP / SMR - PAHO / WHO) made it clear that during the first half of the 20th century (1901 -1950), the hygienic conditions of the Urabá region were quite primitive. NACER attributed the sanitary problems of The Region to stagnant water

Table 4: Living Conditions in El Tres, Turbo, and other parts of the Urabá during two periods: 1940-1980 & 1996-2012

Location	Historical Period	Living Conditions	Location	Historical Period	Living Conditions
Urabá	1901-1950	“Precarious hygienic conditions” Many areas of stagnant water Lack of outhouses and sewage systems Poor quality garbage services “Finding drinking water in this region was (in 1950) and is (in 2012) a real problem.” Source: 52	Urabá Antioquia	2008	Unmet Human Needs: 67% (Urban-57%; Rural-74%) Source: 60
Urabá	1943	A complete lack of public services in Urabá. This situation has not changed much since 1943.	Urabá Antioquia	2010	Majority of towns and divisions lack potable water. Only 24% of homes have access to sewers Most sewage goes into rivers and ditches untreated. Garbage services: poor quality
Turbo	1997-1998	More than half the population is classified as living in extreme poverty. 18% are illiterate in 1999. Source (46)	El Tres, Turbo	2009-2010	The lack of drinkable water remains a grave problem.
			Turbo	2009-2010	Diets lack Vitamin A 52% of population at risk for chronic malnutrition. Source: (21)
			El Tres, Turbo	2010	Chronic Malnutrition: 25% Anemia: 100% High levels of malnutrition & parasites in infants less than one year old Source: 4, 40, 41

(promoting the growth of mosquitos), lack of toilets, and irregular garbage services. Finally, it discussed health problems arising from the poor sanitary conditions at the municipal slaughterhouses. (52) The NACER report continued: "Access to water has been (since the 1950's) and remains (in 2012) problematic for the poor. They cannot afford to build cisterns so they rely on puddles and streams in their

surroundings for drinking water. During the summer months, these are their only source of water. ... Cisterns depend upon rain water and, as a consequence, during periods of drought the lack of water reaches alarming proportions. ... Despite the fact that Urabá had a population of 9,100 inhabitants in 1943 there were no public services. ... By the 1960's this situation had not changed fundamentally.”

“Progress” has clearly taken its time in arriving to Urabá. Statistics from 2002 show that potable water was available in 80.9% of the northern, urban areas), followed by 71% for the banana producing areas (only 31.7% in rural areas), and 18.7% in the Altrato Medio.

The NACER report went on to note that: "Only 24% of the population in Urabá has access to sewer services. This is well below the Departmental average of 67.2%. More concerning yet, most sewage simply flowed into rivers and streams without any treatment. Energy and telecommunications services were also lacking. Sanitation services were notably inefficient." (52) By 2012 only 67% of Turbo's urban population and 62% of its rural citizen had any form of plumbing. (53) A 2012 study reported on the status of residents in three urban districts of Turbo who lacked water: "Living without water generates constant anxiety; it affects food security, health, living conditions, and the possibility of living decently." (54)

In March 2015, the national government announced that potable water would be made available to all households in San Juan de Urabá, an urban sub-region with over 20,000 inhabitants. (55) But there are skeptics who noted: "After 27 years of drinking rainwater, the municipality now has an aqueduct. But there is water only every third day. While they announced during the inauguration that there would be continuous water, this has not been the case; the aqueduct is also supplying the towns of Montecristo San Juancito, and Callelarga. The aqueduct does not reach neighborhoods far from the center of town such as Villa Bichingo. When the aqueduct is supplying water, everyone opens their faucet, the water pres-

sure drops, and only those in the center get any water." (56)

In 2014 Valencia and his team studied the socioeconomic and cultural aspects of providing public sewage and water services to the towns of Apartadó, Carepa, Turbo, Chigorodó, and Mutatá, all sub-divisions of Urabá. The new services were to be provided by Aguas de Urabá (the Urabá Water Company) which received both financial and technical support from Empresas Públicas de Medellín (EPM). EPM is a governmental agency which essentially controlled the Urabá Water Company.

The researchers found generally acceptable increases in water quality, coverage, and dependability. In fact, the Water Company performed better than required by its contract. This was the result of large investments in the water supply that had been made in the previous four years. However, the researchers expressed concern over the payment structure.

The services, therefore, seem of good quality but the simple provision of water did not lift the communities out of poverty because many could not pay their bills. Users who did not pay their monthly fees accumulated a large debt. (57) To summarize the report: Yes, they now have water, but no, they still cannot afford it.

Another government report (2010) examined the safety of rural aqueducts in Urabá. It identified 74 aqueducts, only 5% of which were classified as without risk to human health. (58) Stated otherwise, 95% did not provide potable water. Coverage by urban and rural sewerage services in 2010 in Urabá reached 80% and 15% of households respectively. (58)

Data from 2010-2012 found that Urabá's children experienced worse sanitary and social

conditions than the rest of the Antioquia Department. These findings replicate prior studies in Urabá and Bajo Cauca Antioqueños. (21-23, 28, 38) These regions – along with the southern parts of the neighboring Department of Cordoba (Alto Sinú and San Jorge) – are responsible for more than 60% of Colombia's malaria cases. (36, 37, 59)

Studies in El Tres have examined the mothers of children with malaria. 14% are illiterate, and only 61% have a primary education. 17% have a specific trade. 21% earn money (in marginal jobs). 63% work for someone else and 37% report that they are managers. Their monthly salary in 2005-2010 was about US\$·80 per month. In El Tres, only 12% of families own some land, only 1% actually work their own farms, the remaining land is unused. Barely 13% own any tools or farming equipment. Over half the houses have either sand or dirt floors. 39% of rural and 61% of urban dwellers have water inside the house; urban families pay for their water. Rain is used as the sole source of water for drinking and cooking in 76% of households. Only 41% have any plumbing. (4, 21-23, 38, 40)

Nutritional conditions are also sub-standard. Data from Turbo (2009-2010) showed that, family consumption of foods rich in vitamin A sources (times / week) was as follows: animal meat or innards (weekly), milk and eggs (2-3 times a week), and fruits with provitamin A (2-3 times a week). This meant that only 55% of families met requirements for Vitamin A consumption. Fifty-two percent of inhabitants were at risk for chronic malnutrition and 80% had pathogenic intestinal parasites. (21)

The alarming level of living conditions is corroborated by government data on unmet basic needs (60), illiteracy (48), number of homes with drinking water (39), food insufficiency (61) and hyper-concentration of access to land. (62)

The historical context for "progress" in Urabá

Progress and social development, understood as the equal benefit for all inhabitants and not just for those who have economic power, has not yet arrived in Urabá. (4, 5) This does not mean, however, that capitalist progress and development have not occurred. They have, but only a few benefit; the vast majority is further marginalized. Under capitalism, the generation and appropriation of wealth is structurally dissociated from the equitable distribution of wealth. This means that "progress" generates more social and economic inequity and inequality. (4, 5) Thus, we see that the accelerated and sustained economic growth present in Urabá in the last 50-60 years (primarily due to the banana industry) is associated with almost no social development to the benefit of the population.

Aramburo points out that the history of Urabá can be roughly divided into three periods: (1) colonization (installation of a new culture, up to 1964), (2) capitalism (the development of a new socio-political model, 1964-1995), and (3) the war with its consequences (the decline of politics, 1995 until today). (63) These periods correspond to the socio-economic processes of pre-capitalist production (colonization), and the subsequent establishment of capitalism as a dominant force (under conditions both of relative peace and

open warfare against the workers, peasants, and small and medium-sized land owners.

Steiner notes that "in a country that was just beginning to glimpse the promise of an elusive development, after several years of civil wars, it should come as no surprise that the border regions were considered backward when compared to those of the center. Some of the latter areas, such as the Department of Antioquia, were already well linked to world markets and had a definite identity within the nation." (64) One of those backward border areas was Darién (now called Urabá) which was lost to Panama at the beginning of the 20th Century.

Steiner adds that: "in the colonial discourse on Urabá, Antioquia wanted not just to exploit the area's treasures, specifically its abundant and valuable natural resources, but also to impose its authority on even the most inaccessible regions. Concepts such as 'capturing the spirit of the mountain', 'blending the races', and 'protecting Urabá' became the banner for a colonial project that sought to go beyond simply exploiting the physical wealth of The Region. It wanted to establish an 'Antioquian culture' that it saw as the only cultural alternative." (64)

Urabá in Antioquia, during the period from 1950 to 2010, evolved from being "a marginalized, isolated, and newly populated territory", to become "the tumultuous setting for an explosive mixture of settlers, greedy multinationals, combative unions, and local bosses. Eventually guerrillas and paramilitary forces were added into the mix, giving rise to bloody fights that eventually involved the surrounding (unarmed) population. Initially, Urabá attracted little attention on the national stage, but over

time the mention of Urabá grew to evoke images both of a chaotic place where order and civilization needed to be imposed from outside, as well as a vast wasteland ready for colonization. It promised quick riches for those fleeing poverty, partisan violence, or the police. It conjured up a jungle world where the violence of nature was matched by the violence of men." (Lesonczy in reference 65). Even today, a visit to Urabá involves experiencing a different face of Colombia. One is confronted by the raw fury of nature and its energy and exuberance, along with the dangers (real or imagined) of the jungle. (65)

But Urabá is not just bananas, not just livestock, and not just jungle. The visible face of capitalism in Urabá are the multinational banana companies based in Turbo and Apartadó. They are joined by banana plantations run by local farmers (in Necocli) and the ranchers who raise livestock on large farms and rely on day laborers (in Arboletes). These groups both get along and compete. Ortiz's research into these four towns (conducted in 1996) sought to trace the trajectory of these properties – livestock and/or banana – belonging to the main investor groups in 1990. He found that they all came from properties that were originally considered as wasteland back in the 1950's and 1960's. Records for a few went back to 1945. But many of these properties had not been registered until the 70's or 80's. (65)

The predominant feature of land ownership in Urabá has been the accelerated and large scale hyper-concentration of property into the hands a few persons. (65) In 2007, concentration continued in the livestock business, which received a large influx of capital from the co-

caine trade. Involvement of the drug trade has been less in the banana industry. (65) Understanding the concentration of land ownership in Antioquia (as well as the structure of rural landownership) is an important area of research. In 1995, 85.5% of the owners owned less than 20 hectares and occupied 14.7% of the total area, indicating that 85.3% of the territory was in the hands of 14.5% of the owners of large and medium-sized estates. The period 1995-2004 was characterized both by further concentration of land ownership as well as the further breaking-up of small minifundios. In 2004, the number of land owners had increased by 158% over 1995, but their proportions remained almost unchanged, with 85.8% of owners owning only 15.3% of total land; this means that 14.2% of the owners now owned 84.7% of the land.

The property structure favors the formation of latifundios; land tenure in Antioquia is increasingly made up of vast farms whose size precludes proper productive use. (62) During the period 1995-2004, the Gini index for land ownership in Antioquia fluctuated around 0.32. This confirms that landownership inequality is a persistent problem and one that remains to be solved. In Urabá, the Gini coefficient in 2015 was 0.72. In Turbo, the Gini (2002) was 0.83, indicating ownership of the land in a few hands. (66)

On December 31, 2014 Urabá, had 7,641 registered companies. Ninety-five per cent of these were microenterprises (as is the case in other parts of Colombia). The small, medium and large companies represented 3.6%, 1.1% and 0.3% of all companies (respectively).

Economic Sectors: Wholesale and retail trade continues to be the most common sector within the total conformation of local business; in 2014 it involved 3,908 companies, or about half of all registered companies. The second largest sector was housing and food services 11.8%, followed by manufacturing industries 6.4%; other service activities 4.3%; and finally, agriculture, livestock, hunting, forestry and fishing with 4.1%.

Assets: Financial activities were ranked in 2014 in the first position in terms of value of the reported assets (44.4% of reported assets). They were followed by wholesale and retail trade (18.4%), and agriculture, livestock and hunting (15.6%) (67).

Prior prevalences of intestinal parasites.

Notwithstanding what has been said about the serious and chronic social crisis in Urabá, it is important to emphasize that Urabá is not the only Colombian region that has been forgotten by progress. In Colombia, similar crises are widespread, affect all regions, and impact the lives of millions of workers, rural workers, the unemployed, and other members of the "shadow" population of those on the margins. Using the same indicators of social and economic development to evaluate living conditions, let us look at what is happening elsewhere in the country.

Puerta and his collaborators undertook a study in 2010 with an indigenous population residing in two Amerindian reservations in Chigorodó, Antioquia (the Chigorodocito and Polines reservations), one Amerindian reservation of El Carmen de Atrato, Chocó (El Dieciocho reservation), and the Kogui community

settled in Umandita, Magdalena. They found that 85% of the population had polyparasitism; the most frequent parasites were: *Blastocystis* sp. (73%), *A. lumbricoides* (46%), *T. trichiura* (40%), *E. histolytica* / *E. dispar* (33%) and *G. intestinalis* (28%) (69). These are indigenous Colombians, founders of our country, for whom the promise of progress has been long delayed.

At the other extreme, in the Mecca of Colombian capitalist development, Medellín, Cardona and Bedoya (2013) found that 31% of the inhabitants of several marginal neighborhoods had pathogenic intestinal parasites (95% confidence interval %: 25 to 36%). (3) A "National survey of intestinal parasitism in the school age population" has been carried out and a preliminary report, released in 2013, presented data on a group of schoolchildren from ages 7-10 who came from ten municipalities in four departments. The children came from small towns and large cities, from urban and rural areas. The researchers found that the prevalence of specific pathogenic parasites was

- *N. americanus* / *A. duodenale*: 34%
- *A. lumbricoides* 38%
- *T. trichiura* 34%
- *G. lamblia* 34%
- *E. histolytica* / *E. dispar* 55% (68)

This is unequivocal evidence that social misery prevails in all the populations of the country. It is not part of anyone's "heritage." Clearly, "progress", evaluated in terms of intestinal parasites and basic living conditions has not reached the majority of Colombians.

The living conditions of the urban and rural families of El Tres and Turbo continue today as they were 50 years ago. The prevalence of in-

testinal parasites has not been reduced but remains at levels reported half a century ago.

Conclusions:

- 1) Chronic malnutrition, anemia, and deficiencies of iron and vitamin A affect a high proportion of children under 15 in Turbo and Urabá. They are the result of the economic poverty and the social marginalization of the vast majority of the population.
- 2) Echoing findings from several decades ago, parasites, hunger, and malnutrition continue to coexist and interact in children under 15 years of age in Turbo. A half century of governmental attempts to address the problem have resulted in programs that have been short lived and partial.
- 3) In the 75 years, between 1940 and 2015, the living conditions of Turbo and Urabá have improved little or not at all. This conclusion is based on the evidence that the prevalence of intestinal parasites today is almost the same as it was in 1940.
- 4) Economic progress in Urabá has benefitted a few industrialists, farmers, ranchers, traders, and the transnational corporations. For the majority of inhabitants though, social progress has stalled. Current living conditions are similar to those of 50 to 70 years ago. The prevalence of parasitic infections remains a good indicator of living conditions.

Financing

Colombian Institute for the Development of Science and Technology (Colciencias) (projects 111556933361, 111571149686); Committee for the Development of Research (CODI) -University of Antioquia (projects 2014-969,

References

1. Cox FE. History of human parasitology. *Clin Microbiol Rev.* 2002;15(4):595-612.
2. Breilh J. *Epidemiología crítica: ciencia emancipadora e interculturalidad.* Buenos Aires, Argentina: Lugar Editorial; 2003.
3. Cardona J, Bedoya K. Frecuencia de parásitos intestinales y evaluación de métodos para su diagnóstico en una comunidad marginal de Medellín. *Iatreia.* 2013;26(3):257-68.
4. Carmona-Fonseca J, Correa Botero A. Parásitos intestinales y desnutrición en niños en Urabá (Colombia) interpretados según las condiciones de vida del país: soledad y olvido. *Rev salud ambient.* 2013;13(2):108-19.
5. Correa Botero A, Arias M, Carmona-Fonseca J. Equidad e igualdad sociales y sanitarias. Necesidad de un marco conceptual científico. *Medicina Social.* 2012;7(1):5-12.
6. OPS. *Salud en las Americas: 2007.* 622 PCyTN, editor. Washington D.C: Washington; 2007.
7. Chan MS. The global burden of intestinal nematode infections--fifty years on. *Parasitol Today.* 1997;13(11):438-43.
8. Gamboa MI, Basualdo JA, Córdoba MA, Pezzani BC, Minvielle MC, Lahitte HB. Distribution of intestinal parasitoses in relation to environmental and sociocultural parameters in La Plata, Argentina. *J Helminthol.* 2003;77(1):15-20.
9. Botero J, Castaño A, Montoya M, Hurtado M, Ocampo N, Agudelo G. Anemia por deficiencia de hierro y su asociación con los parásitos intestinales en escolares y adolescentes matriculados en instituciones oficiales y privadas de Medellín, 1997-1998. *Acta Med Col.* 2002;27(1):7-14.
10. Botero-Garcés JH, García-Montoya GM, Grisales-Patiño D, Aguirre-Acevedo DC, Alvarez-Uribe MC. *Giardia intestinalis* and nutritional status in children participating in the complementary nutrition program, Antioquia, Colombia, May to October 2006. *Rev Inst Med Trop Sao Paulo.* 2009;51(3):155-62.
11. Cortés J, Salamanca L, Sánchez M, Vanegas F, Sierra P. Parasitismos y estado nutricional en niños preescolares de instituciones del Distrito Capital. *Rev Salud Publica.* 1999;1(2):172-8.
12. Flórez C, Pinzón M, Hurtado M, Armenta C, Torres K, Dusán G, et al. Situación del parasitismo intestinal en seis departamentos de Colombia 2000-2005. *Biomedica.* 2005;25(Supp 1):106-7.
13. Galán R, Agualimpia C, Corredor A, Cáceres E. *Investigación Nacional de Morbilidad. Parasitismo intestinal.* Pública MdS, editor. Bogotá, D.C: Ascofame; 1969.
14. Gallego M, Gómez J, Torres E, Lora F. Prevalencia de la *Entamoeba histolytica* en asentamientos temporales post terremoto de la ciudad de Armenia. *Infectio.* 2003;7(4):190-4.
15. Londoño Alvarez J, Hernández A, Vergara Sánchez C. Parasitismo intestinal en hogares comunitarios de dos municipios del departamento del Atlántico, norte de Colombia. *Bol Mal Salud Amb.* 2010;50(2):251-60.
16. Alcaraz G, Bernal C, Cornejo C, Figueroa N, Múnera M. Estado nutricional y condiciones de vida de los niños menores de cinco años del área urbana del municipio de Turbo, Antioquia, Colombia, 2004. *Biomedica.* 2008;28(1):87-98.
17. Giraldo-Gómez J, Lora F, Henao L, Mejía S, Gómez-Marín J. Prevalencia de giardiasis y parásitos intestinales en preescolares de hogares atendidos en un programa estatal en Armenia, Colombia. *Rev Salud Pública.* 2005;7(3):327-38.
18. Medina-Lozano A, García-Montoya G, Galván-Díaz A, Botero-Garcés J. Prevalencia de parásitos intestinales en niños que asisten al Templo Comedor Sagrado Corazón Teresa Benedicta de la Cruz, del barrio Vallejuelos, Medellín, 2007. *Iatreia.* 2009;22(3):227-34.
19. Belo S, Rompão H, Gonçalves L, Grácio MA. Prevalence, behavioural and social factors associated with *Schistosoma intercalatum* and geohelminth infections in São Tomé and Príncipe. *Parassitologia.* 2005;47(2):227-31.
20. Rinne S, Rodas EJ, Galer-Unti R, Glickman N, Glickman LT. Prevalence and risk factors for protozoan and nematode infections among children in an Ecuadorian highland community. *Trans R Soc Trop Med Hyg.* 2005;99(8):585-92.
21. Carmona-Fonseca J. Alimentación y estado nutricional de niños en zonas palúdicas de Antioquia. *Med UNAB.* 2011;14(2):94-102.
22. Carmona-Fonseca J, Arias M, Correa A, Lemos M. Malaria gestacional y condiciones de vida. *Medicina Social.* 2011;6(2):97-107.
23. Carmona-Fonseca J, Uscátegui R, Correa A. Condiciones de vida en zonas palúdicas de Antioquia (Colombia), 2005. *Invest Educ Enferm.* 2010;28(2):240-9.
24. Booth M, Graham A, Viney M. Parasitic co-infections: challenges and solutions. *Parasitology.* 2008;135(7):749.

25. Carmona-Fonseca J. Evolución temporal del hemograma en niños con malaria. *Iatreia*. 2008;21(3):237-52.
26. Ivan E, Crowther NJ, Rucogoza AT, Osuwat LO, Munyazesa E, Mutimura E, et al. Malaria and helminthic co-infection among HIV-positive pregnant women: prevalence and effects of antiretroviral therapy. *Acta Trop*. 2012;124(3):179-84.
27. Blair S, Carmona J, Correa A. Malaria en niños: relaciones entre nutrición e inmunidad. *Rev Panam Salud Publica*. 2002;11(1):5-14.
28. Carmona-Fonseca J. Malaria, desnutrición y parasites intestinal en los niños colombianos: interrelaciones. *Iatreia*. 2004;17(4):354-69.
29. Morales-González J. El hambre al servicio del neoliberalismo. Bogotá, D.C: Ediciones desde abajo; 2006. 255 p.
30. Hall A, Hewitt G, Tuffrey V, de Silva N. A review and meta-analysis of the impact of intestinal worms on child growth and nutrition. *Matern Child Nutr*. 2008;4 Suppl 1:118-236.
31. Koski KG, Scott ME. Gastrointestinal nematodes, nutrition and immunity: breaking the negative spiral. *Annu Rev Nutr*. 2001;21:297-321.
32. Kim CH. Retinoic acid, immunity, and inflammation. *Vitam Horm*. 2011;86:83-101.
33. Cox FE. Concomitant infections, parasites and immune responses. *Parasitology*. 2001;122 Suppl:S23-38.
34. Raqib R, Cravioto A. Nutrition, immunology, and genetics: future perspectives. *Nutr Rev*. 2009;67 Suppl 2:S227-36.
35. Crompton DW, Nesheim MC. Nutritional impact of intestinal helminthiasis during the human life cycle. *Annu Rev Nutr*. 2002;22:35-59.
36. Carmona-Fonseca J. La malaria en Colombia, Antioquia y las zonas de Urabá y Bajo Cauca: panorama para interpretar la falla terapéutica antimalárica. Parte 1. *Iatreia*. 2003;16:299-318.
37. Carmona-Fonseca J. La malaria en Colombia, Antioquia y las zonas de Urabá y Bajo Cauca: panorama para interpretar la falla terapéutica antimalárica. Parte 2. *Iatreia*. 2004;17:34-53.
38. Carmona-Fonseca J, Uscátegui R, Correa A. Parasites intestinal en niños de zonas palúdicas de Antioquia (Colombia). *Iatreia*. 2009;22(1):27-46.
39. Carmona-Fonseca J, Correa, Botero AM. La determinación social de la salud-enfermedad: el caso de los parásitos intestinales y la desnutrición en niños y familias en Urabá, Colombia. *Medicina Social*. 2013;8(1):73-84.
40. Carmona-Fonseca J, Correa A. Determinación social de la desnutrición y el retardo sicomotor en preescolares de Urabá (Colombia). Un análisis con la Epidemiología Crítica. *Rev Fac Nac Salud Pública*. 2014;32(1):40-51.
41. Antioquia. Atlas veredal del departamento de Antioquia. 2 ed. Medellín: Departamento Administrativo de Planeación, Gobernación de Antioquia; 2007. 285 p.
42. Patiño-Camargo J. Helminthiasis y protozoosis en Colombia. *Rev Fac Med*. 1940;8:375-411.
43. Antioquia. Enfermedades relacionadas con la contaminación fecal del ambiente. Servicio Seccional de Salud de Antioquia. *Boletín Epidemiológico de Antioquia*. 1979;4(4):42-59.
44. Granda Ugalde E, Breilh J. Investigación de la salud en la sociedad: Guía pedagógica sobre un nuevo enfoque del método epidemiológico. Quito: Ceas (Centro de Estudios y Asesoría en Salud); 1980.
45. Breilh J. Epidemiología, economía, medicina y política. 3 ed. Mexico D.F.: Premia; 1986. 244 p.
46. Botero D. Parasites intestinales, cisticercosis e hidatidosis. *Iatreia*. 1990;3(3):165-71.
47. Faust E, García Laverde, A, Botero D. Observaciones sobre helmintiasis humanas adquiridas del suelo en la República de Colombia. *Rev Fac Medicina*. 1965;33(2):39-49.
48. Univalle. Perfil del Municipio de Turbo: Universidad del Valle; 1999 [Available from: http://prevencion-violencia.univalle.edu.co/observatorios/antioquia/turbo/archivos/perfil_turbo.pdf].
49. López González M. Pobreza y oportunidades para los jóvenes en las subregiones del Oriente y el Urabá Antioquias. *Periódico Alma Mater*. 2006.
50. Incoder. Plan Estratégico para la Región de Urabá-Darién. In: Departamento Nacional de Planeación DAdPdA, Junta Efemérides Urabá, editor. Medellín2006. p. 94-117.
51. Urabaunavistaalmundo. Urabá una vista al mundo Urabá, la tierra que todos queremos, la mejor esquina de América [Internet]2009. [cited 2016]. Available from: <http://urabaunavistaalmundo.blogspot.com.co/2009/04/pobreza-es-del-50-por-ciento-en.html>.
52. Nacer. Cultura y Salud en Urabá: retos para la reducción de la mortalidad materna. Medellín: Dirección Seccional de Salud y Protección Social de Antioquia; 2008. 122 p.
53. Turbo. Plan de desarrollo 2012 – 2015. Turbo, retomando el camino del progreso. In: Departamento de Antioquia MdT, Alcaldía municipal, editor. Turbo2012.

54. Rodríguez Villamil L, Restrepo Mesa S, Zambrano Bejarano I. Carencia de agua y sus implicaciones en las prácticas alimentarias en Turbo, Antioquia. *Rev salud pública*. 2013;15(3):421-33.
55. Colombia. En San Juan de Urabá, Antioquia estrenarán mañana acueducto con un 100% de cobertura. In: Ministerio de Vivienda RdC, editor. Bogotá, D.-C2015.
56. Machado A, Asprilla D. San Juan de Urabá, con acueducto pero sin agua. Las 2 Orillas [Internet]. 2015 Mayo, 2016. Available from: <http://www.las2orillas.co/san-juan-de-uraba-con-acueducto-pero-sin-agua/>.
57. Valencia Tamayo P, Madrid Hoyos L, Tabares Sánchez J. Inversiones en infraestructura versus comportamiento de pago de los clientes en Aguas de Urabá S.A. E.S.P. In: Facultad de Derecho UdSB, Seccional Medellín, editor. Artículo presentado para optar al título de Especialista en Servicios Públicos Domiciliarios. Medellín2014. p. 24.
58. Antioquia. Análisis de Situación de Salud. Antioquia, 2010. In: Antioquia SSdSyPSdAGd, editor. Medellín2012.
59. Padilla-Rodríguez JC, Álvarez-Uribe G, Montoya-Araújo R, Caparro-Narváez P, Herrera-Valencia S. Epidemiology and control of malaria in Colombia. *Mem Inst Oswaldo Cruz*. 2011;106 Suppl 1:114-22.
60. Antioquia. Anuario Estadístico de Antioquia 2008. Medellín: Gobernación de Antioquia; 2009.
61. Álvarez Uribe M, Benjumea Rincón M, Roldán Jaramillo P, Maya Gallego L, Martínez Barrientos M, Montoya Puerta E. Perfil alimentario y nutricional de los hogares del Urabán Antioquia: Gobernación de Antioquia; 2005. 278 p.
62. Mora T, Muñoz J. Concentración de la propiedad de la tierra y producto agrícola en Antioquia. 1995-2004. *Ecós de Economía*. 2008;26:71-108.
63. Aramburo Siegert C. Región y orden: el lugar de la política en los órdenes regionales de Urabá. Medellín: Universidad de Antioquia; 2003.
64. Steiner C. Imaginación y poder: el encuentro del interior con la costa en Urabá, 1900-1960. Medellín: Editorial Universidad de Antioquia; 2000. 159 p.
65. Ortiz Sarmiento C. Urabá: pulsiones de vida y desafíos de muerte. Medellín: La Carreta Editores; 2007.
66. Ortiz Lara E. Programa de Gobierno del Distrito Especial Portuario de Turbo, 2008-2011. "Dios, Equidad y Justicia Social". Turbo somos todos. 2008.
67. Ramírez Vásquez E. Informe Socioeconómico, 2014. In: Urabá CdCd, editor. 2014.
68. Valderrama Vergara J. Encuesta nacional de parasitismo intestinal en población escolar, fase II: Ministerio de Salud y Protección Social, República de Colombia; 2013 [Available from: <http://www.minsa-lud.gov.co/sites/rid/Lists/BibliotecaDigital/RIDE/VS/PP/ET/FASE%20ENCUESTA%20NAL%20PARA-SIT.pdf>].
69. Puerta P, Salazar P, Velásquez L, Vélez O. Estado actual de las parasites intestinales en cuatro comunidades indígenas de Colombia. 2011;31(Sup 3):98-9.

