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Chagas disease (CD) causes 12,500 deaths annually in Latin America. As a neglected disease primarily associated with poverty, it is a major driver of health inequity. Argentina's efforts to control vector transmission have been unsuccessful. Using new survey data ($n=400$ households), we compare the social patterning of the burden of CD by examining socio-demographic predictors of self-reported CD and the presence of *vinchucas* in two areas of rural northern Argentina known to have experienced different interventions in surveillance and control. Our analyses suggest that Avellaneda, an area known for horizontal intervention strategies which nurture community participation is quite distinct from Silípica, an area which has experienced a vertical intervention strategy since 1990. Avellaneda has higher level of self-reported Chagas infection and lower level of *vinchuca* presence; Silípica has pronounced and statistically significant differences patterned by the head of household's level of educational attainment. A greater awareness of the disease and its transmission, along with community mobilisation and spraying, may bring about more self-reported CD and less *vinchuca* presence in Avellaneda than in Silípica. This suggests that strategies based on community participation may be effective in reducing the social patterning of the burden of disease, even in poor places.

Keywords: Chagas disease; community participation; Argentina; inequity; regression

Introduction

Neglected infectious diseases (NIDs) are a heterogeneous group of parasitic and bacterial diseases whose persistence is closely associated with environmental and social conditions (Holveck et al. 2007, Mathers et al. 2007, Hotez et al. 2008). NIDs are primarily diseases of poverty (Ault 2007, Crompton and Pearson 2008), affecting marginalised segments of populations with limited access to water, housing and education (Hunt 2007). They are also diseases that impose significant social and financial burdens on individuals, families and communities (Hotez et al. 2007). As a result, NIDs are best understood as both outcomes and key drivers of the profound inequities that exist in Latin America.

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Chagas disease (CD) ranks among the most significant NIDs in Latin America (Hotez et al. 2007). Recent World Health Organisation (WHO) estimates suggest that more than 7 million people are infected with CD in the region, with most infected people living in settings of economic marginalisation (TDR/SWG 2009). CD is largely asymptomatic and under-diagnosed (Lugones 2001). It is estimated to produce 12,500 annual deaths in Latin America (OPS/WHO/NTD/IDM 2006). It is also a significant cause of morbidity (WHO 2002), work disability and increased health-care costs (Dias 2007). A potential clinical consequence of *Trypanosoma cruzi* (*T. cruzi*) is chagasic cardiomyopathy which may lead to heart failure and sudden death (WHO 2002).

Chagas disease (CD) in Argentina

There are three routes of disease transmission: vectorial, congenital and through blood transfusion, with vectorial transmission being the most frequent (Prata 2001). This is clearly the case in Argentina, where CD is primarily caused by the protozoan *T. cruzi*, borne by a triatomine bug commonly referred to as *vinchuca*. *Vinchucas* colonise sub-standard dwellings (WHO 2002, Dias 2007) and also pose significant concerns in rural areas characterised by close contact between humans and animals. It is through this colonisation that 'man becomes an active component of the epidemiological chain of CD' (TDR/SWG 2009, p. 9, our translation). The conditions that make this colonisation possible are economic under-development, inadequate housing and the inequitable distribution of resources (Briceño-León 1990, Bastien 1998).

Spraying of insecticides and entomological surveillance have been the main epidemiological tools to control vectorial transmission (Segura 2002). During the 1960s and 1970s, national programmes for vector control were designed and launched (Dias et al. 2002). Since their inception, vector-control activities were attached to centralised and vertical structures conducted with a top-bottom approach. Occasionally, horizontal strategies involving primary health-care services (PHCS) in vectorial control were promoted; these often opened important opportunities for community participation as well (Segura 2002). Vector-control efforts proved successful as incidence of new infections by *T. cruzi* diminished by 70% between 1983 and 2000 (Moncayo 2003). However, this progress has been uneven. Brazil, Chile and Uruguay succeeded in interrupting vectorial disease transmission (TDR/SWG 2009), but Argentina failed in achieving that goal. Although Argentina carried out massive sprayings between 1960 and 1990 with a drastic reduction of *T. cruzi* prevalence, it never succeeded in its efforts to build an epidemiological surveillance system for the prevention and control of CD (Zaidenberg et al. 2004).

Since 1982, Argentina experienced important shifts between models and organisational strategies for dealing with CD. In a decentralisation process characterised by complex relationships between national and provincial programmes, these changes limited the country's ability to develop entomological and epidemiological surveillance in provinces particularly affected by *vinchucas* (Llovet and Dinardi 2006). This is the case in the province of Santiago del Estero, a highly endemic area. Starting in the early 1990s, National and Provincial Chagas Programmes (PCP) agreed to split the provincial territory to undertake control and prevention activities. The National Chagas Programme (NCP) was in charge of

24 out of 27 *departamentos* (a sub-provincial administrative unit, in Spanish), one of them Avellaneda (28°35'53.86"S, 62°56'47.11"W). Meanwhile, the PCP was left in charge of the remaining three, one of them Silípica (28°03'3.64"S, 64°13'30.86"W). As a consequence of this division of responsibilities, and because the PCP never committed to community participation as a tool for control and surveillance actions, a top–bottom approach prevailed in Silípica.

Community participation initiatives and primary health-care involvement have been developed in Argentina, but never in a systematic fashion. A consequence is that what may be called 'natural experiments' can be found in the country. This study compares the social patterning of the burden of CD by examining socio-demographic predictors of self-reported CD and the presence of *vinchucas* in two areas known to have experienced different strategies in surveillance and control.

Community participation in surveillance and disease control

Since the late nineteenth century, community participation in public health programmes has been shown to be successful in reducing the burden of infectious diseases, particularly in the context of weak states (Vaughan 1991, Manderson 1996). The aim of these experiences had been to encourage the population to adopt preventive measures in the absence of public health agencies. In a related but different vein, community participation in health, as a principle introduced by Declaration of Alma Ata is still a powerful concept in the international arena, where populations are expected to 'identify their own health priorities and implement appropriate strategies on that basis' (Espino et al. 2004, p. 4). This complex concept 'encompasses a spectrum of approaches and strategies' (Espino et al. 2004, p. 9), which can be summarised in the utilitarian and the empowerment perspectives (Morgan 2001).

The utilitarian approach sees community participation as a mean for goal achievement, allowing for effective and efficient programme implementation (Uphoff et al. 1998, Morgan 2001). In contrast, the empowerment approach considers community participation as an end in itself (Morgan 2001, Espino et al. 2004).

The utilitarian approach has been widely used in prevention and control programmes for some tropical and vector-borne diseases, including CD (Bryan et al. 1994, Briceño-León 2001, Espino et al. 2004). In the context of CD prevention and control, more active or more passive utilitarian approaches have been applied (Bryan et al. 1994). Reported benefits arising from community participation include vector-density reduction, increased cost-effectiveness of interventions and, in some cases, shrinking figures of *T. cruzi* transmission to humans (Bryan et al. 1994).

Pioneering community participation initiatives in 1985 was the María Project in Río Hondo, Santiago del Estero, initiated by the National Ministry of Health. It was a horizontal intervention as PHCS were significantly involved in entomological surveillance (Chuit et al. 1992, Segura 2002). Furthermore, María Project surveyed knowledge on disease transmission and control methods, attitudes and inclinations of rural inhabitants regarding participation (Mercer 1988). Nonetheless, community participation was kept at a low level, as dwellers' main role was to grant access to their houses to be sprayed and to provide parental authorisation for serological studies of newborn babies. Thus, community participation was mostly passive (Bryan et al. 1994).

Between 1992 and 1998, Argentina launched a large national initiative to establish a vector surveillance system based on community participation, training community leaders and members for *Triatoma infestans* detection and house spraying (Chuit et al. 1992, Segura et al. 1994, Segura 2002). Within this framework, 77 participatory workshops were held in Avellaneda, organised by the NCP with local support. Following this development, in 2002 and 2003 social networks in Avellaneda with more than 300 participants were set up to support interventions and sprayings (Segura 2005). Community involvement was, in this case, mostly active (Bryan et al. 1994).

Thus, Avellaneda's history of control intervention differs from that experienced by other areas, including our second field site, Silípica. These differences reflected the approach undertaken by the NCP and the PCP. In Avellaneda, a horizontal intervention strategy with community participation had been applied by the NCP. In Silípica, a vertical intervention strategy was carried out by the PCP since 1990. In Avellaneda during 2003 and 2004, the NCP sprayed dwellings with the involvement of social networks and designed a framework for a bottom-up notification path. Serological surveillance was also carried out among the population that was under 14 years old. Thus, interventions with horizontal arrangements stretched out on and off in Avellaneda for a period of 10 years. After 2004, however, due to political instability, community participation was brought to a standstill.

Unlike Avellaneda, the scattered CD interventions in Silípica have to be traced far back in time. Between 1983 and 1985, serosurveys were conducted under PCP guidance. In 1994, PCP sprayed dwellings and no further control actions took place until 2006.

In light of the broad consensus among researchers and policy-makers that CD is intimately related to social conditions (WHO 2002, Dias 2007), we may expect that the process of community participation that characterises Avellaneda may yield benefits that may now be detected. Thus, a relevant research question is if community participation in a concrete experience of vector control and surveillance has been able to mitigate inequity in CD distribution in the population.

Methods

The two research sites are in Santiago del Estero, a CD endemic area. This is a poverty-stricken province where the most vulnerable sector are rural dispersed households experiencing a high level of unsatisfied basic needs (48%), higher than the overall rate for Argentina (31%; INDEC 2001).

Educational achievement in the province is low; 25% of the population older than 15 years has less than elementary-level education, almost doubling the figure at the national level (INDEC 2001). Also, 63% of population has no health insurance, relying only on a feeble public health-care system, surpassing the national figure, 48% (INDEC 2001). Between 2001 and 2005, 51 out of 76 acute cases of CD reported in Argentina were identified in Santiago del Estero (Ministerio de Salud 2002, 2005, 2006). Samples of rural households were drawn from two *departamentos*, Avellaneda and Silípica. Despite modest improvements (Gómez 2004), both Avellaneda and Silípica rank among the poorest *departamentos* in the country. The selection criterion sought to control for socio-demographic traits and economic

similarity on the one hand and different interventions for CD control and surveillance that health authorities carried out during the last 15 years, on the other.

Data collection

A cross-sectional survey was carried out. Data gathering was done through a 63 closed- and open-ended questionnaire (available upon request). The survey's goal was to collect the following information: (1) socio-demographics (age, sex, relation to household head, education and occupation); (2) community participation in vectorial-transmission prevention and control (involvement in control and surveillance activities, *vinchuca* presence in the dwelling, attitude towards *vinchucas* when found, information sharing regarding vector detection, frequency of meetings with neighbours to discuss community matters and participation in community institutions); (3) health and health-care access (CD condition, serotests for pregnant women and children); and (3) domestic and household habits (years of dwelling occupancy, dwelling improvements, shuffling of furniture and household stuff, and beliefs related to their dwelling's infestation with *T. infestans*).

Sampling

A random sample of 400 rural households was drawn (Avellaneda, $N = 200$; Silípica, $N = 200$). Sample selection of households was done in two stages: selection of census segments and selection of households within each segment. A team of local interviewers and a field supervisor was trained using role-playing techniques to build rapport and rehearsing real-life situations by research-team members. Fieldwork took place between August and September 2006, i.e., 3 years after the community participation experience ended, and was greatly facilitated by the good response of key local people who acted as gatekeepers. Overall, the refusal rate was a satisfactory 7%. An informed consent letter was given to sampled householders or read aloud in case of illiteracy. This letter explained the reason for the study, and provided information on CD in the province. An institutional ethical committee reviewed and approved the research design. Data were processed and analysed using SPSS 17.0.

Data analysis

These analyses examine socio-demographic predictors of: (1) a household member having CD, and (2) the presence of *vinchucas* in the household. A two-step modelling process was used: first, bivariate models examine the relationship between each predictor and the dependent variable. This was followed by models that included all of the predictors, regardless of their significance in the bivariate stage. To enable a comparison of how predictors operated across the two localities, separate models were run for Avellaneda and Silípica. Results from the logistic regression models are presented through odds ratios (OR) and 95% confidence intervals (95% CI).

Results

Comparison of the two localities indicates important differences, with Avellaneda displaying a worse profile on key indicators (Table 1). Most notably, respondents

from Avellaneda are more likely to indicate that a household member has CD (37.4% vs. 13.7% in Silípica, $\chi^2 = 26.06$, $p < 0.001$). Data from Avellaneda also indicate a higher proportion of households where the head of the household had little or no formal schooling (70.8% vs. 48.2% in Silípica, $\chi^2 = 20.53$, $p < 0.001$), and a somewhat greater reliance on the agricultural sector for employment. However, the presence of *vinchucas* was reported to be higher in Silípica.

The two areas differ with respect to households' participation in community activities (Table 2). Households in Avellaneda are more likely than households in Silípica to belong to a community network (20.6% vs. 5.5%, $\chi^2 = 19.91$, $p < 0.01$) and are far more likely to report meeting with neighbours to discuss problems (31.5% vs. 6.5%, $\chi^2 = 40.61$, $p < 0.01$). When asked what type of problems they discussed with neighbours, water issues/drought was the most common response in both localities.

Table 1. Description of the sample.

	Avellaneda		Silípica		Total		Significance
	N	%	N	%	N	%	
Dependent variables							
Household member with Chagas disease							
Yes	67	37.4	24	13.7	91	25.7	<0.001
No	112	62.6	151	86.3	263	74.3	
Presence of <i>vinchucas</i> in the household							
Yes	100	50.0	148	74.0	248	62.0	<0.001
No	100	50.0	52	26.0	152	38.0	
Independent variables							
Education							
Less than primary	138	70.8	93	48.2	231	59.5	<0.001
Primary or more	57	29.2	100	51.8	157	40.5	
Age (head of household, years)							
20–39	48	24.2	58	29.0	106	26.6	0.676
40–49	42	21.2	37	18.5	79	19.8	
50–64	54	27.3	56	28.0	110	27.6	
65 or more	54	27.3	49	24.5	103	25.9	
Sex (head of household)							
Female	33	16.7	43	21.5	76	19.1	0.220
Male	165	83.3	157	78.5	322	80.9	
Single-parent household?							
Yes	37	18.5	34	17.0	71	17.8	0.695
No	163	81.5	166	83.0	329	82.3	
Occupation (head of household)							
Agricultural sector	112	56.0	89	44.5	201	50.3	<0.05
Non-agricultural sectors	88	44.0	111	55.5	199	49.8	
Household size							
3 or less	61	30.5	45	22.5	106	26.5	<0.001
4 or 5	39	19.5	64	32.0	103	25.8	
6 or 7	57	28.5	42	21.0	99	24.8	
8 or more	43	21.5	49	24.5	92	23.0	

Note: Percentages may not add to 100% due to rounding. Significance values based on chi-square tests.

Table 2. Participation in community activities, Avellaneda and Silípica.

	Avellaneda		Silípica		Total		
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	Significance
Do you or does a member of your household...							
Actively participate in C & S workshops?							
Yes	26	13.0	0	0	26	6.5	<0.001
No	174	87.0	200	100	374	93.5	
Carry out activities to control <i>vinchucas</i> in your home?							
Yes	63	31.5	48	24.0	111	27.7	0.094
No	137	68.5	152	76.0	289	72.5	
If yes, are these activities supervised?							
Yes	13	20.6	0	0	13	11.7	<0.001
No	50	79.4	48	100	98	88.3	
Give notice when <i>vinchuca</i> is found?							
Yes	23	11.5	3	1.5	26	6.5	<0.001
No	177	88.5	197	98.5	374	93.5	
Attend meetings at the local school? ^a							
Yes	103	60.9	125	68.7	228	65.0	0.129
No	66	39.1	57	31.3	123	35.0	
Participate in a community network?							
Yes	41	20.6	11	5.5	52	13.1	<0.001
No	158	79.4	188	94.5	346	86.9	
Attend meetings at church?							
Yes	98	49.2	111	55.8	209	52.5	0.192
No	101	50.8	88	44.2	189	47.5	
Attend meetings at the club?							
Yes	65	32.7	61	33.3	126	33.0	0.889
No	134	67.3	122	66.7	256	67.0	
Participate in activities at the hospital or health centre?							
Yes	20	10.1	13	6.6	33	8.4	0.220
No	179	89.9	183	93.4	362	91.6	
Meet with neighbours to discuss problems?							
Yes	63	31.5	13	6.5	76	19.0	<0.001
No	137	68.5	187	93.5	324	81.0	

^aAsked only of households with children of school age.

Note: Percentages may not add to 100% due to rounding. Significance values based on chi-square tests.

CD prevention and spraying were reported by a few households in Avellaneda and none in Silípica as the topic of discussion with neighbours. Importantly, only respondents from Avellaneda ($n=26$) had participated in community workshops devoted to the surveillance and control of *vinchucas* (C & S workshops). Households in Avellaneda may also be more likely than households in Silípica to carry out activities to control *vinchucas* in their home (31.5% vs. 24.0%), although that difference was not statistically significant at the $p < 0.05$ level. Only households from Avellaneda reported receiving any kind of supervision of their *vinchuca* control activities. Similarly, almost all the households that report *vinchucas* to local authorities when found are from Avellaneda. Household participation in churches', clubs' and schools' activities was similar across both localities.

Table 3 presents the results of a series of regression models that examine the predictive power of demographic variables and household characteristics on the probability that a household reports a member with CD. Education is a statistically significant predictor in Silípica, with households where the head has little or no formal schooling having an increased probability of having a member with CD (OR = 4.03, 95% CI = 1.37–11.82). Women as the head of the household also displays predictive power of having a member with CD in Silípica (OR = 5.60, 95% CI = 1.10–28.57), but not in Avellaneda. Age of the head of the household does not display explanatory power in any of the models, nor does their occupation or single-parent status. Household size is also not a significant predictor, with the exception of very large households (eight or more members) in Avellaneda having an increased likelihood of having a member with CD.

Educational attainment of the head of the household displays a similar relationship when the presence of *vinchucas* is considered as the dependent variable (see Table 4); very little difference is observed within Avellaneda (OR = 1.09, 95% CI = 0.57–2.11), although it approaches significance in the Silípica models

Table 3. Logistic regression (predictors of having a household member with CD).

	Avellaneda				Silípica			
	Model 1: unadjusted		Model 2: adjusted		Model 3: unadjusted		Model 4: adjusted	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Socio-demographics								
Education								
Primary or more	1.00	–	1.00	–	1.00	–	1.00	–
Less than primary	1.63	0.82–3.24	1.97	0.94–4.15	2.75	1.06–7.13	4.03	1.37–11.82
Age (head of household, years)								
20–39	1.00	–	1.00	–	1.00	–	1.00	–
40–49	1.13	0.46–2.73	0.88	0.33–2.34	0.71	0.20–2.54	0.43	0.10–1.84
50–64	0.99	0.42–2.33	1.05	0.42–2.66	0.71	0.23–2.18	0.43	0.11–1.66
65 or more	0.53	0.22–1.31	0.87	0.29–2.59	0.69	0.21–2.26	0.31	0.06–1.54
Sex (head of household)								
Male	1.00	–	1.00	–	1.00	–	1.00	–
Female	0.47	0.19–1.16	0.50	0.14–1.80	2.20	0.86–5.64	5.60	1.10–28.57
Single-parent household?								
No	1.00	–	1.00	–	1.00	–	1.00	–
Yes	0.54	0.24–1.24	0.66	0.26–1.69	1.86	0.67–5.17	0.43	0.09–2.17
Occupation (head of household)								
Non-agricultural sectors	1.00	–	1.00	–	1.00	–	1.00	–
Agricultural sector	1.17	0.63–2.15	0.93	0.46–1.91	0.81	0.34–1.93	0.96	0.28–3.26
Household size								
3 or less	1.00	–	1.00	–	1.00	–	1.00	–
4 or 5	1.89	0.74–4.85	1.42	0.48–4.22	1.44	0.34–6.14	1.43	0.28–7.24
6 or 7	2.24	0.98–5.15	1.52	0.54–4.29	2.80	0.67–11.78	2.49	0.44–14.16
8 or more	4.09	1.68–9.96	3.14	1.02–9.71	2.74	0.67–11.19	2.17	0.44–10.67

(OR = 2.05, 95% CI = 0.99–4.24). No other independent variable attains statistical significance in these models.

Discussion

Cross-sectional self-reported data on CD in the households and *vinchuca* presence reflect the history of epidemiological intervention in Avellaneda and Silípica. Our analyses suggest that Avellaneda, an area known for horizontal intervention strategies that nurtured community participation, is quite distinct from Silípica, an area that has experienced a vertical intervention strategy since 1990. Institutional arrangements involving national and sub-national levels of CD agencies played a key role in defining the intervention strategies that would be followed in Avellaneda and Silípica. Our data show that Avellaneda has a higher level of *known* CD, a lower level of *vinchuca* presence, whereas Silípica has pronounced and statistically significant differences patterned by the head of household's level of educational attainment. A greater awareness of the disease and its transmission, community mobilisation and

Table 4. Logistic regression (predictors of having *vinchucas* in the household).

	Avellaneda				Silípica			
	Model 1: unadjusted		Model 2: adjusted		Model 3: unadjusted		Model 4: adjusted	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Socio-demographics								
Education								
Primary or more	1.00	–	1.00	–	1.00	–	1.00	–
Less than primary	0.99	0.54–1.84	1.09	0.57–2.11	1.75	0.91–3.38	2.05	0.99–4.24
Age (head of household, years)								
20–39	1.00	–	1.00	–	1.00	–	1.00	–
40–49	0.71	0.31–1.62	0.69	0.28–1.66	0.95	0.35–2.59	0.79	0.27–2.31
50–64	0.67	0.31–1.47	0.62	0.27–1.14	0.60	0.26–1.41	0.48	0.19–1.22
65 or more	0.78	0.36–1.70	0.71	0.28–1.83	0.59	0.25–1.42	0.38	0.13–1.11
Sex (head of household)								
Male	1.00	–	1.00	–	1.00	–	1.00	–
Female	0.51	0.24–1.11	0.42	0.15–1.17	1.43	0.63–3.22	2.00	0.63–6.41
Single-parent household?								
No	1.00	–	1.00	–	1.00	–	1.00	–
Yes	0.41	0.19–0.87	0.95	0.41–2.19	1.43	0.58–3.53	1.14	0.43–3.03
Occupation (head of household)								
Non-agricultural sectors	1.00	–	1.00	–	1.00	–	1.00	–
Agricultural sector	1.18	0.67–2.06	0.87	0.45–1.67	1.26	0.66–2.38	1.43	0.64–3.17
Household size								
3 or less	1.00	–	1.00	–	1.00	–	1.00	–
4 or 5	0.75	0.34–1.69	0.59	0.23–1.53	1.33	0.56–3.16	0.96	0.35–2.66
6 or 7	0.62	0.30–1.28	0.44	0.17–1.13	1.02	0.40–2.57	0.65	0.20–2.12
8 or more	0.83	0.38–1.82	0.63	0.27–1.73	1.25	0.50–3.13	0.95	0.31–2.85

spraying may bring about more self-reported CD and less *vinchuca* presence in Avellaneda than in Silípica.

Across our regression models, education displays an effect consistent with the literature on social determinants of health (CSDH 2008, Harling et al. 2008, De Maio et al. 2009), but it only attains statistical significance in the Silípica models predicting the presence of a household member reporting CD. These results may be a sign that Avellaneda's horizontal intervention strategy alleviates an important aspect of inequity (as marked by educational attainment of the head of the household). At the same time, our findings are consistent with existing work that emphasises the major impact that gender inequality has on the distribution of NIDs (Danis-Lozano et al. 2002, Manderson et al. 2009). Results from Silípica and Avellaneda indicate that horizontal prevention strategies may be associated with a decreased gender differential in CD. This suggests that horizontal intervention strategies based on rural community participation may be effective in reducing the social patterning of the burden of disease, even in poor places.

Our models suggest that educational differences are significant in Silípica but not Avellaneda for presence of a household reporting a member with CD. Additionally, female head of household is a significant predictor of CD in Silípica, but not Avellaneda. These patterns are repeated in the models predicting the presence of *vinchucas*, but without statistical significance for either education or sex of the head of the household. This weaker significance may be a reflection of the way in which the two dependent variables – household member with CD and *vinchuca* presence – interact with different levels of social organisation. On one hand, the self-reported presence of a member with CD may be more directly related to health care and prevention measures at the level of each individual household. On the other hand, self-reported *vinchuca* presence is susceptible to household-specific behaviour as well as environmental factors and collective action.

Fragility is a well-known feature of community participation experiences. That is less so, when it is led – initiated and developed – by external agents mainly in the case of vector-borne diseases (Espino et al. 2004). However, despite the advantage gained by an external orientation, this does not in itself guarantee that the participative experience will endure. Avellaneda's experience shows that sustainability of these endeavours is an issue. Factors such as low social capital of neglected populations (Dias 2001) and resistance by sub-national decision makers (Kahssay and Oakley 1999) collude in eroding community participation. This is particularly the case in Argentina, where implementation of community participation – with diverse degrees of intensity – has in some ways been a response to public health failures (Morel 2006) rather than a long-term structural strategy. After 2004, community actions in Avellaneda were brought to an end and a return to a vertical strategy was proposed, but this has not been immediately applied. Paradoxically, in Argentina, community participation terminology is widely used in public documents and as a keyword in the technical guidelines of the national health system (Llovet and Dinardi 2008). However, the potentiality of a co-operative interaction between horizontal and vertical arrangements has been poorly explored and applied.

There are several limitations to these analyses. Most notably, these include our use of self-reported measures and our reliance on cross-sectional, rather than longitudinal data. Available studies assume self-report as a *proxy* of health condition

and can be found in the literature for different settings and diseases providing empirical support when measuring health and morbidities (Keating et al. 2005, Subramanian et al. 2009). However, no studies of self-report of CD have been found. This void may be attributed to its asymptomatic and under-diagnosed characteristics. Our own use of CD self-report departs from the former as we intend to capture the comparative distribution of disease awareness and information across households.

Regarding self-report of vector presence, self-report measures were previously used in rural Morelos, México, when potential risk factors for *Triatoma pallidipennis* domiciliary infestation were examined by Cohen et al. (2006). More importantly, a study conducted in Cuernavaca, Mexico, using combined methods ranging from specialised entomological observation to householder's reporting the presence of bugs inside or outside houses, concluded that householders were reliable informants, with 85% correlation between reported bug sightings and detection of infestation (Ramsey et al. 2005).

Self-reported health data should be subject to cautious treatment as dissonant relationships between these and other health indicators may occur (De Maio 2007). There may also exist clearly an element of reporting error, with tendencies that may lead to under-reporting (e.g., lack of knowledge, fear of stigma, social desirability) and over-reporting (e.g., acquiescence, or a respondent's tendency to answer questions in a way that they believe will be helpful to the interviewer). These limitations notwithstanding, we have no reason to believe that the patterning of responses would differ between areas in the same province; that is, under- and over-reporting should not be expected to be more pronounced in Silípica than in Avellaneda. Relative comparison of self-reported CD condition and *vinchuca* presence across the *departamentos* under study therefore may yield important insight.

Disaggregated longitudinal rather than cross-sectional data on socio-economic variables, like housing quality improvement, or knowledge and practices variables would also have enriched the analysis.

Conclusion

NIDs mainly affect poor rural populations, imposing social and financial burdens on individuals, families and communities. Not only does socio-economic inequality bring about health inequity but it is also reinforced by these health outcomes. In this way, NIDs such as CD are both outcomes and key drivers of the profound inequities that exist in countries like Argentina.

As a consequence of organisational arrangements reached by NCP and PCP, a definite horizontal strategy with community participation was applied in Avellaneda. This strategy played a role to lessen inequities in health outcomes. Our results indicate that in the case of CD, inequity amelioration can be experienced by vulnerable populations through community participation in surveillance activities. Some of the differences regarding households' involvement in health-related issues, e.g., prevention, may be attributed to horizontal participation *vis-à-vis* vertical intervention. This suggests that horizontal intervention strategies based on community participation may be effective in reducing the social patterning of the burden of disease, even in poor places. Nonetheless, excessive confidence on community-based

horizontal models may lead to incomplete and frustrating experiences, particularly if it ‘unloads’ responsibility for health services from the state to marginalised populations. Future studies should explore how horizontal and vertical approaches may be integrated to best meet the population health challenges generated by neglected diseases such as CD.

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