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# Health and informal work conditions among recyclers in the rural area of Medellín, Colombia, 2008

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## ABSTRACT

**OBJECTIVE:** To characterize the work, health and occupational risk conditions of recyclers from the rural area.

**METHODS:** Cross-sectional study, with the participation of one hundred informal recyclers in five *corregimientos* (small administrative units) of Medellín in 2008. The source of information was primary: a structured survey on work, health and occupational risk conditions and also on perceived morbidity, which enabled to characterize the population's risks through descriptive statistics and approach the relationships and associations of the risks with the morbidity in the population.

**RESULTS:** One hundred and four people were engaged in recycling, and 100 of them were included in the study: 34 people belonged to community-based organizations and 66 people worked independently. Social security affiliation, fulfillment of basic needs, work satisfaction, access to training activities and periodic provision of work supplies presented differences according to group ( $p < 0.05$ ). The biological risks, associated with inadequate body postures, and physical and chemical risks had a particular frequency of exposure according to group. The knowledge and use of safety measures for occupational risks differed statistically among the analyzed groups ( $p < 0.05$ ).

**CONCLUSIONS:** Recyclers are a potential support to integral waste management in rural areas of Medellín, although the informal nature of their work exposes them to working conditions that directly affect their health and the health of their families. The social recognition of recycling goes hand in hand with the improvement in the working conditions of the people engaged in this activity. The environmental recycling workers, even if belonging to a union, have precarious work and health conditions. The transformation of these conditions should be one of the State's priorities.

**DESCRIPTORS:** Rural Workers. Solid Waste Segregators. Recycling. Occupational Risks. Working Conditions. Occupational Health. Cross-Sectional Studies

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## INTRODUCTION

The growing global urbanization, derived from the sharp increase in population and industrialization, involves the generation of an increasing amount of solid waste. Its management is an interesting topic, given its environmental and health implications.<sup>11</sup> The problem of garbage disposal is not limited to large cities; it affects small towns as well.<sup>a</sup>

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<sup>a</sup> Organización Panamericana de la Salud. Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente. Seminario internacional sobre rellenos sanitarios y reciclaje. Lima; 1989

Recycling has gained relevance in the last decades due to the fact that it has become a low-cost strategy to reduce wastes. It is a “*niche market*” whose advantages can be observed in the economy of industries, with the consequent reduction in the cost of raw materials, and that has become an income option for impoverished communities with few stable job opportunities available.<sup>8</sup>

The daily generation of waste is estimated to be 28,800 tons in Colombia, of which approximately 45% had the potential to be reused, but only 7% of this amount is recovered. This 7% is the source of income for an important population. Recycling organizations reported that 20,000 families engaged in recycling in 2006.<sup>b</sup> In the metropolitan area of Valle de Aburrá, Antioquia, Colombia, there were 3,190 recyclers in that year, more than 2,000 of which in the city of Medellín.<sup>c</sup>

The process of recycling has three main stages: recovery, processing and commercialization of the reusable waste. Recyclers are involved in the first stage; they are responsible for collecting and selecting the material that will be subsequently reused in other industries, constituting important social actors in the management and administration of solid wastes. Since their work involves the contact with garbage and the constant risks derived exactly from their activity,<sup>10,14</sup> given that the work conditions of these people do not allow them to fully develop their skills, they are exposed to different risks for health and physical integrity and are not able to rely on the social security guarantees established by law.

This leads these people to live in precarious conditions and makes the society not to see them as equal.<sup>2</sup>

The inherent risks related to the recycling activity, which are of biological, physical, chemical, ergonomic, public and psychosocial nature, are intensified by the lack of effective mechanisms to ensure the access of this population to health and social security services.<sup>8</sup>

The characteristics of the recycling work, such as low income, few opportunities to progress by virtue of the low status of the job due to the fact that it requires little knowledge and education, lack of stability, low social security protection, precarious work conditions, and almost no protection against occupational risks, among other peculiarities, lead this activity to be included in the informal sector of the national economy.<sup>2</sup>

In recent years, different efforts have been made to support the creation of cooperatives or social unions

aiming to promote the organization of these groups for business training, strengthening of their work, and improvement of their life conditions.<sup>d</sup>

Environmental authorities have promoted different processes for the inclusion of recyclers in the integrated social management of solid wastes, involving the recyclers resident in the rural areas of the city of Medellín since 2004.

This study aimed to characterize work, health and occupational risk conditions of recyclers from the rural area of Medellín, Colombia.

## METHODS

An exploratory cross-sectional study was conducted in five *corregimientos* (localities) in the rural area of Medellín: Santa Elena, San Antonio de Prado, San Sebastián de Palmitas, AltaVista, and San Cristóbal in 2008.

The population of recyclers from the region of interest was identified by means of a census that involved going through the streets of the locations on the days of garbage collection.

Information was collected using a structured survey that addressed work, health, occupational risks, and perceived morbidity conditions.

A total of 104 people engaged in solid waste recovery in the *corregimientos* took part in the census, 96.4% of which participated in the study after signing a free informed consent.

Data were analyzed using the SPSS software, version 11, obtaining relative frequencies, proportions, prevalence ratios (PR), 95% confidence intervals (95%CI), and *p*- values in order to identify statistical differences between the groups of recyclers with *p* < 0.05.

Participation in the study was voluntary. Recyclers expressed their interest in participating in the research through a written informed consent. This investigation was classified as a harmless investigation, according to the Resolution 8430 of 1993, issued by the Colombian Ministry of Health.

## RESULTS

Thirty-four people engaged in recycling were affiliated to a social organization integrated to the waste

<sup>b</sup> Ministerio de Ambiente, Vivienda y Desarrollo Territorial. Por el desarrollo sostenible del reciclaje: propuesta inicial. Bogotá; 2006.

<sup>c</sup> Sepúlveda-Villada LA. Evaluación económica, social y ambiental de la recuperación de residuos aprovechables con la participación del reciclador informal. Estudio de caso: Barrios Floresta y Santa Lucía de Medellín. Medellín : Universidad Nacional de Colombia; 2005 [cited 2012 Jan 7]. Available from: <http://www.resol.com.br/textos/EVALUACION%20FINAL%20ECONOMICA%20SOCIAL%20Y%20AMBIENTAL%20DEL%20RECLAJE.pdf>

<sup>d</sup> Ramírez-Guerrero J. Capacitación laboral para el sector informal en Colombia. Ginebra: Oficina Internacional del Trabajo; 2002 [Cited 2012 Jan 7] Available from: [http://www.oei.es/etp/capacitacion\\_laboral\\_sector\\_informal\\_colombia\\_guerrero.pdf](http://www.oei.es/etp/capacitacion_laboral_sector_informal_colombia_guerrero.pdf)

recovery center of the *corregimientos*, and 66 worked independently (Table 1).

People working in this business were predominantly male in both groups. The frequency of people in productive age was higher in the group of recyclers who were affiliated with a union, since unaffiliated workers showed higher age values. Similarly, a higher educational level was found in recyclers who were affiliated to the social organization of the waste recovery center than in those who were not, which had a higher

**Table 1.** Population of recyclers according to *corregimiento*. Rural area rural of Medellín, Colombia, 2008.

<i>Corregimiento</i>	Affiliated recyclers		Independent unaffiliated recyclers	
	n	%	n	%
San Antonio de Prado	11	32.4	32	48.5
San Cristóbal	7	20.6	11	16.7
Altavista	6	17.6	12	18.2
Santa Elena	6	17.6	10	15.2
Palmitas	4	11.8	1	1.5
Total	34	100.0	66	100.0

**Table 2.** Characteristics of the population of recyclers from the five *corregimientos*. Rural area of Medellín, Colombia, 2008.

Characteristics of the population	Affiliated recyclers (n = 34)	Unaffiliated recyclers (n = 66)
Age		
Median	32	52
Maximum	57	82
Minimum	18	15
Sex		
Male	64.7% (22)	68.2% (45)
Female	35.3% (12)	31.8% (21)
Marital status		
Single	52.9% (18)	37.9% (25)
Married	17.6% (6)	42.4% (28)
Domestic partnership	17.6% (6)	9.1% (6)
Widowed	0	3.0% (2)
Divorced	11.9% (4)	7.6% (5)
Educational level determined by completed level		
None	11.8% (4)	54.5% (36)
Elementary	55.9% (19)	36.4% (24)
High school	29.4% (10)	9.1% (6)
Vocational	2.9% (1)	0% (0)
Socioeconomic status		
1	11.8% (4)	34.8% (23)
2	85.3% (29)	59.1% (39)
3	2.9% (1)	6.1% (4)

frequency of people with complete elementary and high school education, including technical training (Table 2).

Both groups, affiliated and unaffiliated, emphasized that their work was not only a source of income and a way of being useful to the economy, but it also contributed to society, since it was directly involved in the maintenance of a cleaner environment (perception higher than 40% in unaffiliated recyclers and higher than 59% in affiliated recyclers).

The working periods (in hours per day and in days per week), as well as the need of having another informal occupation, was similar in both groups; work autonomy at work, application of knowledge at work, and rest during the week did not show statistically significant differences among the groups (Table 3).

The fulfillment of basic needs provided by the income derived from the recycling activity, work satisfaction, working with a companion, practice of relaxation exercises, access to training activities, and periodic provision of work supplies showed statistically significant differences favoring recyclers affiliated to the recovery centers (Table 3).

There were differences in terms of distance covered for the collection of recyclable material, with statistical significance favoring unaffiliated recyclers, mostly of which covered distances of less than 500 m (Table 3); affiliated recyclers covered broader regions due to availability of a vehicle. These recyclers had greater and better working means and instruments.

Being a recycling worker affiliated to a business social organization enabled the recyclers to have the social security guarantees established by the Law 100 of 1993, such as health, benefits, and membership to insurance companies for occupational risks; 57% of the unaffiliated recyclers were linked to the health system, most of them through the system supported by the State. Ten unaffiliated recyclers had all the social security guarantees derived from the alternative occupations taken up by these people. Differences in social security were statistically significant in both groups favoring recyclers affiliated to the waste recovery centers.

Both groups exhibited risk factors of biological nature, related with inadequate body postures, physical risk and chemical risk, inherent to their work, with significant differences regarding a higher frequency of exposure of unaffiliated recyclers to the contact with sharps and/or fluid-contaminated material and to sudden temperature shifts ( $p < 0.05$ ). Affiliated recyclers were less exposed to vibrations and repetitive movements ( $p < 0.05$ ), due to the fact that the staff of the waste recovery center managed the grinding of the recovered material for commercialization purposes (Table 4).

**Table 3.** Work conditions of recyclers. Rural area of Medellín, Colombia, 2008.

Work conditions	Affiliated recyclers				Unaffiliated recyclers				OR	95%CI	p <sup>a</sup>
	Yes		No		Yes		No				
	%	n	%	n	%	n	%	n			
Working period lower than or equal to 8 hours per day	51.5	17	48.5	16	63.6	42	36.4	24	1.41	0.66;3.0	0.36
Working 5 days or less during the week	81.8	27	18.2	6	85.5	53	14.4	9	0.76	0.24;2.37	0.64
Income fulfills needs	55.9	19	44.1	15	30.3	20	62.1	41	2.59	1.09;6.15	0.02
Alternative occupation	32.4	11	55.9	19	42.4	28	48.5	32	1.5	0.61;3.71	0.36
Working with a companion	100	34	0	0	54.5	36	43.9	29	<sup>b</sup>		0
Covering a distance of less than 500 metros	55.2	16	44.8	13	78.8	41	21.2	11	0.33	0.12;0.88	0.02
Work satisfaction	97.1	33	0	0	63.6	42	24.2	16	<sup>b</sup>		0.0009
Work autonomy	94.1	32	5.9	2	93.9	62	3	2	0.51	0.06;3.83	0.43
Application of knowledge at work	97.1	33	2.9	1	87.9	58	10.6	7	3.98	0.47;33.7	0.16
Rest during the week	85.3	29	14.7	5	98.4	61	7.6	5	0.47	0.12;1.77	0.26
Relaxation exercises	64.7	22	35.3	12	9.1	6	42.4	28	8.55	2.76;26.42	0.0001
Provision of supplies	100	34	0	0	27.3	18	69.7	46	<sup>b</sup>		0
Quarterly provision of supplies	64.7	22	22.2	8	4.5	3	95.5	63	57.7	14.05;237.9	0
Access to training activities	94.1	32	2.9	1	25.8	17	72.7	48	90.4	11.44;713	0.000

<sup>a</sup> Statistical significance with  $p < 0.05$

<sup>b</sup> Not calculated because one of the frequencies is 0

Higher levels of conflict with family and other people were found in unaffiliated recyclers ( $p < 0.05$ ). Recyclers reported that they were rejected by the society because of their work; social support and recognition were higher among affiliated recyclers who perform the work in social organizations.

The recyclers were aware of the safety measures to face the risks related to the recycling work. However, this awareness had statistically significant differences between the study groups ( $p < 0.05$ ): affiliated recyclers showed higher awareness. The use of safety measures was in favor of affiliated recyclers, and the regular change of clothing for work was the only measure that did not show statistically significant differences ( $p = 0.79$ ). The use of masks, goggles, overalls or aprons, earplugs, waist protectors, peak hats, and vaccination in the last six months as minimum safety measures for the recycler was more frequent in affiliated recyclers (prevalence ratios  $> 1$ ).

Attendance to doctor's appointments due to health-related events was not very frequent among recyclers ( $p = 0.5$ ). This population has experienced different health-related events that produced perceived morbidity, and osteomuscular disease, respiratory conditions, and stress were the most frequent perceived events in the previous month among recyclers. Perceived morbidity by osteomuscular diseases, tooth disorders, hypertension,

and heart disease in the previous month showed statistically significant differences: it was higher among unaffiliated recyclers (Table 5).

Animal or insect bites had statistically significant differences among recyclers, with a higher frequency among affiliated recyclers (Table 5).

## DISCUSSION

Recycling was introduced in rural areas as a job option for their inhabitants. In this study, there were 104 people from the five *corregimientos* of Medellín to whom recycling was an income option for economic sustenance. A total of 33% of them were affiliated to community unions supported by state environmental institutions that dedicate resources to the integrated waste management in the localities belonging to their area of jurisdiction. Ribero<sup>c</sup> (2003) reported that six out of ten workers in the metropolitan areas of Colombia were engaged in the informal sector in 2006 and that 30% of the families engaged in recycling were members of organizations, whereas 70% worked independently.<sup>a</sup>

There is a group of recyclers organized in the rural area of Medellín that can be categorized into the informal sector of the national economy, according to their particular features.

<sup>c</sup> Ribero R, Gender Dimensions of Non – Formal Employment in Colombia (March 2003). CEDE Working Paper No. 2003-04. Available from: <http://ssrn.com/abstract=393943> or doi:10.2139/ssrn.393943

**Table 4.** Work-related risk factors among recyclers. Rural area of Medellín, Colombia, 2008.

Risk factor	Affiliated recycler				Unaffiliated recycler				OR	95%CI	p <sup>a</sup>
	Yes		No		Si		No				
	%	n	%	n	%	n	%	n			
<b>Biological</b>											
Decomposing material	88.2	30	11.8	4	97	64	3	2	4.2	0.74;24.5	0.1
Sharps and/or fluid-contaminated material	94.1	32	5.9	2	100	66	0	0			0.04
<b>Physical</b>											
Working in bad weather conditions	100	34	0	0	95.5	63	4.5	3	<sup>b</sup>	<sup>b</sup>	<sup>b</sup>
Working in covered places	100	34	0	0	43.9	29	56.1	37	<sup>b</sup>	<sup>b</sup>	<sup>b</sup>
Sufficient lighting in covered places	64.7	22	26.5	9	36.4	24	6.1	4	2.28	0.65;8.0	0.14
Working at night	73.5	25	8.8	3	78.8	52	12.1	8	0.84	0.22;3.21	0.51
Lighting in night working	20	5	80	20	17.3	9	82.7	43	0.81	0.25;2.63	0.5
Working in dusty areas	64.7	22	35.3	12	60.6	40	31.8	21	1.04	0.43;2.49	0.91
Vibrations	64.7	22	35.3	12	33.3	22	66.7	44	0.28	0.11;0.66	0.003
Noise	91.2	31	8.8	3	83.3	55	16.7	11	0.53	0.15;1.91	0.22
Cold	79.4	27	20.6	7	77.2	51	21.2	14	0.96	0.35;2.62	0.95
Heat	79.4	27	20.6	7	87.9	58	12.1	8	1.8	0.63;5.53	0.24
Temperature shifts	58.8	20	41.2	14	83.3	55	16.7	11	3.4	1.35;8.6	0.007
Sources of energy	79.4	7	20.6	27	12.1	8	81.8	54	0.57	0.19;1.69	0.3
<b>Related to inadequate body postures</b>											
Raising heavy loads	79.4	27	20.6	7	69.7	46	30.3	20	0.61	0.23;1.61	0.32
Pulling on heavy loads	64.7	22	35.3	12	62.1	41	37.9	25	0.9	0.38;2.11	0.81
Uncomfortable position	70.6	24	29.4	10	59.1	39	60.9	27	0.61	0.25;1.47	0.27
Repetitive movements	94.1	32	2.9	1	81.8	54	18.2	12	0.2	0.03;1.15	0.02
Distensions	55.9	19	44.1	15	54.5	36	45.5	30	0.95	0.41;2.16	0.9
<b>Chemical</b>											
Inhalation of gases or steam	79.4	27	20.6	7	72.7	48	27.3	18	0.71	0.27;1.88	0.49

<sup>a</sup> Statistical significance with p-values < 0.05

<sup>b</sup> Not calculated because one of the frequencies is 0

Percentages were calculated taking as a denominator the recruited populations of affiliated recyclers (n = 34) and unaffiliated recyclers (n = 66).

The definition of informal economy can be analyzed both from the structuralist point of view (comprising unpaid family workers, self-employed workers with no professional or technical qualifications, domestic workers, employees and owners of private companies with up to ten workers) and from the institutionalist point of view, which is grounded in the labor and institutional compliance with the social security guarantees related to health, registration in benefit programs, and work contract.<sup>11</sup>

Currently, it is complex to consider a single definition of informality, due to the increasing losses in terms of hires and social benefits in formal markets, which employs paid workforce through networks in informal markets. The informal sector is characterized as a reserve army of labor that is engaged in survival activities and become functional to capitalist system by reducing production costs and being manipulated by this system.<sup>11</sup>

This last situation would correspond to the informal recyclers affiliated to community-based social organizations in the *corregimientos* of Medellín, since such organizations are weak and rely on the resources provided by the local state departments to survive and continue to exist.

According to Mariatti<sup>5</sup> (2009), the work that can be performed at the community center, in the street or at home assumes a mantle of false freedom outside the factory, but is deeply determined by the capital and by market demands to lower costs and restore profit rates, as it occurs with recycling.

Another point of view on the economic sector was considered from the environmental perspective. The growing need of preserving natural resources led recycling to be valued not only as a job option for many people engaged in solid waste recovery, but also as a productive activity

**Table 5.** Perceived morbidity events in the last month by recyclers. Rural area rural of Medellin, Colombia, 2008.

Condition	Affiliated recycler				Unaffiliated recycler				OR	95%CI	p <sup>a</sup>
	Yes		No		Yes		No				
	%	n	%	n	%	n	%	n			
Aggression by others	5.9	2	94.1	32	7.6	5	92.4	61	1.31	0.24;7.14	0.55
Allergy	8.8	3	91.2	31	13.6	9	86.4	57	1.63	0.41;6.47	0.36
Acute intestinal and diarrheal disease	11.7	4	88.3	30	22.7	15	77.3	51	2.21	0.67;7.26	0.14
Sense organs	11.7	4	88.3	30	15.2	10	84.8	56	1.33	0.38;4.63	0.44
Acute respiratory	26.5	9	73.5	25	43.9	29	56.1	37	2.17	0.88;5.37	0.08
Mucosa	23.5	8	76.5	26	18.2	12	81.8	54	0.72	0.26;1.98	0.52
Respiratory	61.8	21	38.2	13	53.0	35	47.0	31	0.69	0.30;1.62	0.4
Skin	14.7	5	85.3	29	9.1	6	90.9	60	0.58	0.16;2.05	0.39
Hernia	0.0	0	100.0	34	1.5	1	98.5	65	<sup>b</sup>	<sup>b</sup>	0.47
Osteomuscular	32.4	11	67.6	23	60.6	40	39.4	26	3.2	1.34;7.6	0.007
Hypertension	2.9	1	97.1	33	24.2	16	75.8	50	10.56	1.33;83.5	0.007
Diabetes	0.0	0	100.0	34	4.5	3	95.5	63	<sup>b</sup>	<sup>b</sup>	0.2
Cardiovascular	0.0	0	100.0	34	12.1	8	87.9	58	<sup>b</sup>	<sup>b</sup>	0.03
Genital-urinary	0.0	0	100.0	34	3.1	2	96.9	64	<sup>b</sup>	<sup>b</sup>	0.3
Traffic accident	0.0	0	100.0	34	3.1	2	96.9	64	<sup>b</sup>	<sup>b</sup>	0.3
Home accident	5.9	2	94.1	32	12.1	8	87.9	58	2.21	0.44;11.02	0.27
Burn	5.9	2	94.1	32	4.5	3	95.5	63	0.76	0.12;4.79	0.55
Hepatitis	0.0	0	100.0	34	1.5	1	98.5	65	<sup>b</sup>	<sup>b</sup>	0.47
Tooth	0.0	0	100.0	34	10.6	7	89.4	59	<sup>b</sup>	<sup>b</sup>	0.04
Nervous system	5.9	2	94.1	32	7.6	5	92.4	61	1.3	0.24;7.14	0.55
Anemia	0.0	0	100.0	34	7.6	5	92.4	61	<sup>b</sup>	<sup>b</sup>	0.09
Stress	50.0	17	50.0	17	50.0	33	50.0	33	1	0.43;2.28	1
Cancer or tumor	0.0	0	100.0	34	1.5	1	98.5	65	<sup>b</sup>	<sup>b</sup>	0.47
Animal or insect bite	44.1	15	55.9	19	22.7	15	77.3	51	0.37	0.15;0.90	0.02

<sup>a</sup> Statistical significance with p-values  $p < 0.05$

<sup>b</sup> Not calculated because one of the frequencies is 0

well accepted by society, due to its several environmental, social and economic contributions.<sup>f</sup>

Such concept on recycling was also perceived by its own actors in the present study. They expressed the importance of their work as a source of economic sustenance and as a contribution to environmental sustainability.

Reynals<sup>f</sup> (2002) reports that the growth of the recycling activity in the cities, called the “magnitude of the phenomenon of garbage collectors”, changed the relationships with these social actors and allowed for the creation of other new relationships with local governments, transportation companies, civil society organizations, universities, neighborhood organizations, among others. Thus, local governments were pressed to implement interventions that were very

heterogeneous, including bills, concession contracts, promotion of business organizations, social policy agreements, municipal policies, training and meetings, among others.

Medellin, in its rural area, enabled the development of state initiatives of organization that allowed for the engagement of people of younger age and better educational levels in recycling, which has dignified their work.

With the organization of the activity, according to the findings of this study, clear benefits are observed for this population of recyclers, categorized as vulnerable, such as better means and instruments to perform the work, more effective safety measures to face the inherent risks of their activity, access to social security, social recognition of the importance of their work, inclusion

<sup>f</sup> Reynals C. De cartoneros a recuperadores urbanos, Seminario internacional Respuestas de la sociedad civil a la emergencia social: Brasil y Argentina comparten experiencias. Sao Paulo, 2002.

in programs of solid waste management existing in their communities, and reduction in occupational risks with the promotion of the use of safety measures.

The difference between the affiliated recycling workers and those who work independently in terms of optimal work conditions was evident in this study. This is similar to what was stated by Mariatti<sup>5</sup> (2009) in his theoretical analysis of labor metamorphosis and recycling. This author, quoting Olesker<sup>5</sup> (2003), demonstrates that the informality of the recycling activity results in insufficient income, lack of working rights, and lower possibility of improving recyclers' economic conditions.

The age of the affiliated recyclers and the predominance of men and of people from low socioeconomic status are in agreement with the studies of Lenis et al<sup>4</sup> (2007). Recyclers were mainly in the productive age group, most of them in the group aged 36 to 45 years, with the majority of the sample belonging to the male sex and to the socioeconomic status 1 and 2, distribution that reflects the few job opportunities available in the country and the poverty conditions caused by unemployment, which leads them to take on this occupation as an income option.

In this type of activity, the working periods of recyclers from the large cities in Colombia tend to last more than nine hours per day and, on average, they work six days during the week.<sup>7</sup>

This study reported the predominance of eight hours of work or less per day and five days of work or less during the week. This trend, relatively lower to that demonstrated in other studies, may be attributed to the lower amount of waste in rural areas and to the lower distances covered, since these locations have a smaller population and a smaller center area compared with large cities.

The similar results for perceived morbidity by recyclers of both groups, both affiliated and unaffiliated, can be explained by the specific characteristics of their work, given that both should perform the same activities for recovering the material. Affiliated recyclers developed additional activities, since they recover biodegradable wastes as well for the development of composting, besides the preparation of some materials to facilitate commercialization.

Acute respiratory infection is a common morbidity event in this type of population, which can be related with to the fact that recycling activities are performed in bad weather conditions.<sup>7,14</sup> Back conditions, muscular pain, and stress were reported as the most prevalent diseases in this study.

The frequency of osteomuscular problems were reported by other authors in this population.<sup>9</sup> This type

of morbidity was found by associating non-ergonomic working factors and musculoskeletal pain, including neurophysiological compromise as an effect of the exposure to chemical substances and compromised psychosocial health related to hazardous psychosocial processes to which recyclers are exposed due to their work.<sup>4</sup>

Other frequent health-related events are acute intestinal and diarrheal disease,<sup>4</sup> although this type of disease did not show significant prevalence in the present study, which is possibly attributable to the unfamiliarity of recyclers with the fact that the hygiene and sanitation conditions of their activity may cause infections that lead to this type of pathology.

The prevalence of symptoms related to enteric diseases and parasite infections in recyclers is significant in regions with similar socioeconomic characteristics to those found in Colombia, such as Manila, Egypt, and Asian regions. These events are accompanied by more than 35 diseases, standing out, besides diarrhea, conditions such as typhoid fever, cholera, dysentery, tuberculosis, anthrax, poliomyelitis, skin disorders, pneumonia, and malaria, diseases highly associated with the hygiene and sanitation conditions of the environment where recyclers perform activities related to recycling.<sup>6</sup>

Working in bad weather conditions and the constant contact with garbage may intensify the risk of an accident due to animal or insect bites, which can potentially transmit infectious diseases to the worker. This factor is perceived by the population of recyclers, although in a greater proportion by affiliated recyclers, possibly due to the fact that they have already become aware of the health consequences of these accidents. Affiliated recyclers were engaged in a higher number of training activities on the risks of their work and can identify insect or animal bites as something harmful for their health.

The aforementioned reinforces the conclusions of Acosta Cabrera et al<sup>1</sup>, in their study on changes in knowledge, attitudes and practices related to the prevention of mosquitoes among a population from Habana, Cuba. It was said that education and training on health-related risks are very important to improve knowledge and change attitudes and risk perception that could prevent any factor that have a negative impact on the health of the population.<sup>1</sup>

Tropical diseases, both emerging and reemerging, may present in this population group due the constant contact with vectors and animals, potential transmitting agents.<sup>9</sup> For example, populations that are in contact with wastes may acquire leptospirosis more frequently.<sup>15</sup>

Working conditions of affiliated and unaffiliated recyclers should be followed and be appropriate so as to allow for the protection of the population against several risk factors for occupational health and for the access to

instruments, devices or tools that facilitate a safe collection, preparation and transportation of the material.

Recyclers have precarious working and health conditions, even those pertaining to community unions. The transformation of these conditions should be one of the State's priorities, since it was acknowledged that this activity is beneficial for the recovery of wastes, the economy, the society, and the environmental sustainability.

Different authors agree on the benefits of the activity performed by people engaged in solid waste recovery, showing the need of including recycling in the policies and plans for an integrated solid waste management.<sup>6,16,17</sup>

It is necessary to promote the social and business organization of these people from cultural, political and economical dimensions, with a perspective not only of the need but also of the opportunity to implement a

responsible solid waste management and to contribute to achieve equality in Colombia and Latin America.<sup>12,13</sup>

The integrated social waste management becomes an alternative for recyclers that can be considered a stable job option, with work conditions that provides them with appropriate tools and instruments to facilitate their labor and protects them against health risk factors derived from their work.

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