How to Cite:
Coulibaly, F. N., N'Guessan, S., & Mé, K. A. (2026). Analysis of the determinants of community health worker performance in Côte d'Ivoire: The case of Madinani Health District. *International Journal of Economic Perspectives*, *20*(7), 757–771. Retrieved from https://ijeponline.org/index.php/journal/article/view/1343

Analysis of the determinants of community health worker performance in Côte d'Ivoire: The case of Madinani Health District

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***Abstract*---**This work focusses analyzing the determinants of community health worker (CHW) performance in Madinani health district (northwestern Côte d'Ivoire) with the aim of improving population access to primary healthcare services. Individual CHW and program contextual data were collected and entered individually with the support of the health district. With support from the NGO Muso, the 134 CHWs were classified into two groups: high-performing (coverage rate ≥ 80%) and low-performing (coverage rate < 80%). Thus, the econometric analysis using a Logit model reveals that male gender, larger household size, and dedicated supervision increase the likelihood of a CHW being more efficient. Dedicated supervision thus plays a key role in creating a structured work environment where community health workers feel supported and guided. This type of supervision is strongly encouraged in CHW programs to ensure good performance.

***Keywords*---**community health workers, performance, determinants.

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Submitted: 27 April 2026, Revised: 09 May 2026, Accepted: 17 June 2026

Introduction

Ensuring the availability and accessibility of primary health care (PHC) to all has been a priority for health systems worldwide since the Alma-Ata Declaration in 1978. The Bamako Initiative adopted in 1987 by African governments, as well as the Ouagadougou Declaration in 2008, placed particular emphasis on community health, which facilitates the implementation of primary health care. One of the fundamental principles of Côte d'Ivoire's 2012–2015 National Health Plan (NHDP) is community participation, which aims to improve population access to primary health care services and restore user confidence in public health services by strengthening care provided at the community level (DSC, 2015). This service, offered at the community level, is provided on the front lines by community health workers (CHWs).

A community health worker (CHW) is any member of the community who supports the effective implementation of an intervention or activity at the community level under the responsibility of the health worker on whom they depend (DSC, 2015). Community health workers are people from their community who play a crucial role in the implementation of the community health approach. They are chosen by their community and trained by technical and financial partners to provide basic health care, carry out communications for social behavior change towards the population on health issues and facilitate access to health care. The fact that they come from the community allows them to gain the trust of the populations and better understand the social and cultural determinants of their health care requests.

In most developing countries, CHWs are essential to fill gaps in the formal health system, particularly in rural and deprived urban areas. CHWs contribute to disease prevention and control, the promotion of maternal and child health, and the management of simple cases of illness in the community by reducing population movement. They also teach populations about essential family practices to enable them to adopt responsible behaviors with regard to their health. There are more than 3.8 million community health workers worldwide, present in at least 98 countries (Global Fund, 2024). However, their number is not enough to meet global needs. Eight (8) African countries, mainly in Uganda, Ethiopia and Rwanda stand out with more than 2 CHWs per 1,000 inhabitants, In Ethiopia, 40,000 women were trained over two years to become CHWs, conducting screening and providing treatment. In Rwanda, the CHW program launched in 1995 has trained more than 58,000 volunteers to screen, provide malaria treatment, and provide family planning advising.

Côte d'Ivoire has not yet reached the target of 2 CHWs per 1,000 inhabitants. In 2022, the country had 17,308 community health workers for a total population of 29,104,217 inhabitants, a ratio of 1 CHW per 1,682 inhabitants (Propel Santé, 2024). By 2024, the total number of CHWs expected in the country is estimated at 200,000, and (DSCPS, 2024 and WHO, 2017) Africa expects to have 2 million by 2030.

The United States Agency for International Development has demonstrated the importance of community health workers by showing that they prevent a child

from dying worldwide every three (3) seconds (UNAIDS, 2017). This result is also visible in Côte d'Ivoire, where a review of community activities at the national level reveals that 94% of confirmed malaria cases in children under five (5) years of age were treated with artemisinin-based combination therapies by CHWs (PROPEL Santé, 2024).

Like many health districts in Côte d'Ivoire, in Madinani health district, populations most frequently resort to CHWs. This resort is justified by several essential factors that respond to the specific needs of rural communities. These include limited access to health services, the shortage of qualified medical personnel, the high prevalence of preventable diseases (malaria, diarrhea, acute respiratory infections) which are common in rural areas, the improvement of universal health coverage and the reduction of health care costs.

With the rise of CHWs in national health systems, having well-performing community health workers remains a critical component for governments and technical and financial partners implementing community health programs. However, CHW programs face challenges, including low attractiveness and financial motivation for CHWs, including poor training, inadequate supervision, lack of supplies, and poor community relations. One of the most frustrating elements of many CHW programs is their high attrition rate. Globally, annual CHW attrition rates range from 3.2% to 77% (Ngilangwa and Mgomella 2018).

To support these CHW programs in national systems, it is necessary to demonstrate not only their performance but also the individual performance of the community health workers themselves. Kok et al. (2015) thus demonstrated the need to consider CHW programs in countries. First, the evidence of the effectiveness of trained and supported CHWs in providing quality health services and improving population health continues to grow. Countries that are making the greatest gains in improving the health of their populations have strong CHW programs, such as Bangladesh, Brazil, Ethiopia, Nepal, and Rwanda. Second, the Declaration of Alma-Ata, which was the first major global health document to affirm the importance of CHWs in 1978, was reaffirmed on its 40th anniversary in the 2018 Declaration of Astana. On this anniversary, the World Health Organization (WHO) created for the first time a guideline to optimize the contribution of CHW programs to health systems.

The following year, the Director-General of WHO and the World Health Assembly strongly affirmed the importance of CHWs in achieving universal health coverage and strengthening primary health care (PHC). The Ivorian health system also takes CHWs into account, although the level of outreach has not yet reached its peak. Community health workers are found in all health districts of the country, especially in rural areas.

The Madinani health district, one of the 113 health districts in Côte d'Ivoire, is not on the sidelines of the implementation of health programs through community health workers. From the above and given the major importance of CHWs in access to primary health care, it is appropriate to ask the question: what are the main determinants of the performance of community health workers?

In conducting this research, this paper aims to analyze the determinants of community health worker performance in Côte d'Ivoire in Madinani health district to achieve universal health coverage through primary health care. More specifically, the aim is to identify and study the individual and contextual factors that influence CHW performance.

The remaining part of this work is divided into two main sections. The first section is a literature review related to the topic, and the second section focuses on the work methodology and results.

1. Literature Review

The first section includes the literature on economic theory on the supply and demand of health care, while the second covers the empirical literature on the performance and determinants of performance of community health workers.

1.1. **Theoretical Foundation of Health, and Economic Development**

1-1-1. Supply and Demand of Health

According to classical thinkers, labor is a major factor of production, alongside capital (Kouassi, 2017). Health is considered an investment in human capital, crucial in endogenous growth models and neoclassical theories (Berthélemy and Tuilliez, 2013). Health is a central element of human capital, defined by the OECD as the set of individual knowledge and skills that promote economic and social well-being. Mushkin (1962), Becker (1964), and Fuchs (1966) highlighted its importance in human capital. Grossman developed a model in which health affects productivity and time spent on production (Grossman, 1972). The demand for health does not follow the rules of the classic market, as it is often involuntary and depends on sociocultural factors (Batifoulier and Domin, 2015). Health cannot be treated as an ordinary consumable good (Raimondeau, 2018). Cost-benefit and cost-utility analyses measure health status through mortality and morbidity indicators (Arweiler, 2002).

1-1-2. **Health and Economic Development**

Historically, improving health and economic development have been closely linked (Berthelemy et al., 2013). Fogel (1990, 2004, 2006) highlights the endogeneity of health progress, which qualifies the direct influence of health on economic development. Disease, such as malaria, reduces mobility and economic activity (Sachs et al., 2001). A high prevalence of malaria can reduce GDP per capita growth by 1.3% per year. Population health is essential for participation in economic activities, particularly agricultural activities (Strauss, 1986; Audibert et al., 1986, 1993, 2003a, 2003b). Pouvourville and Contandriopoulos (2000) suggest that health could explain the different levels of economic development internationally. A healthy diet improves health, academic achievement, and intellectual performance (Behrman and Rosenzweig 2004). Reducing child malnutrition leads to a decrease in chronic diseases, increased education, and improved public health (Berthelemy, 2013), creating a virtuous circle of economic development.

1-2 Empirical Research of the determinants of community Health Worker (CHW) performance. In the literature, CHW performance is influenced by various individual, organizational, and contextual factors. A better understanding of these

determinants allows for optimization of their engagement and effectiveness, thereby strengthening the impact of community health services.

1-2-1. Motivation

Motivation is essential to organizational success and the achievement of individual goals. It refers to all the factors that motivate an individual to take action (Farah, 2021). Performance, on the other hand, is defined as the behaviors that an individual can control and contribute to the organization's goals (Campbell, 1990). In the health sector, the performance of community health workers (CHWs) is a key factor influencing beneficiary satisfaction and overall economic development.

However, their performance cannot be measured in the same way as that of formal health professionals (Gopalan et al., 2012). It is influenced by various factors, including gender, age, education level, marital status, experience, and financial and moral support.

1-2-2. Gender

The link between gender and CHW performance is multidimensional. Women represent approximately 70% of CHWs and play a key role in access to care, particularly in maternal and child health (Global Fund, 2024). However, they face challenges related to mobility and social norms (HIP, 2015). Men, although fewer in number, are more involved in certain activities, such as condom distribution and the fight against HIV (Sebastian et al., 2012). Some authors suggest developing strategies to attract more men into this profession (Njororai et al., 2021).

1-2-3. Age and Experience

The impact of age on CHW performance is debated. On the one hand, the experience of older CHWs improves their effectiveness, particularly in communication and complex case management (Reddy et al., 2016). On the other hand, advanced age can reduce the ability to adapt to new technologies and working methods (Thompson et al., 2020). Furthermore, CHWs' seniority promotes their community recognition and commitment (Lokossou et al., 2019). A study in Senegal showed that more experienced CHWs provide better quality care (Diaby et al., 2019). However, experience does not always guarantee better performance.

1-2-4. Education Level and Marital Status

Educational level influences CHWs' knowledge and skills. Higher education facilitates the assimilation of training and improves service delivery (USAID, 2021). One study showed that secondary education was positively associated with CHW performance (Njororai et al., 2021). However, some studies suggest that even less educated CHWs can be effective thanks to ongoing training (Georgetown University, 2008). Furthermore, marriage can provide social support and greater community acceptance, thus facilitating CHWs' work (Chipukuma et al., 2018). However, it can also be a hindrance, particularly for women who must juggle family and professional responsibilities (WHO, 2017).

1-2-5. Financial, Moral Support, and Household Size

Financial and moral support are crucial for CHW motivation and retention. A system of financial and non-financial incentives (transportation, accommodation) improves their commitment (Haile et al., 2023). A lack of recognition can lead to a high attrition rate (Kok et al., 2015). Furthermore, household size can influence the performance of community health workers (CHWs) through economic, social, and psychological factors. According to Smith et al. (2015), larger households can have an unequal distribution of resources, which can affect members' well-being. However, Jones et al. (2017) point out that these households often offer better emotional and social support, which can encourage CHWs to be more committed to their work. In contrast, Thompson et al. (2018) note that CHWs from smaller households generally benefit from better access to financial resources, promoting better performance.

1-2-6. Contextual Factors

CHW performance also depends on organizational and contextual factors. Chipukuma et al. (2018) identified factors such as training, supervision, resource availability, and the work environment as key determinants. Gaëlle Perrier-Cornet Vareilles (2016) highlights the importance of strategies such as clear role definition, regular training, and appropriate incentives to improve their performance. Intrinsic and extrinsic motivation also play a crucial role in their job satisfaction and effectiveness, as shown by Gopalan et al. (2012).

1-2-7. CHW Adaptive Performance

CHWs' adaptive performance is influenced by their self-motivation, often driven by a love of work and a sense of playing an important role in the community, as indicated by Diaby et al. (2019). Doyle (2013) notes that CHW performance is influenced by individual, organizational, and contextual factors. Overall, improving CHWs' working and living conditions is essential to achieving public health goals, according to the WHO (2018).

2. Methodological Approach and Results

2.1. Population and Data Source

The data used in this study cover all 134 community health workers (CHWs) in Madinani health district located in northwest Côte d'Ivoire. Individual CHW and program contextual data were collected and completed individually with the support of the health district. The explanatory variable, CHW performance, was provided by the NGO Muso. This organization defines a community health worker's performance as their ability to cover their area of activity monthly. This coverage is measured by the proportion of households in the CHW's area that received at least two home visits (HVs) during the month. For example, a CHW responsible for an area with 100 households and having carried out at least two home visits in 85 of these households during the month has a coverage of 85%. This indicator was therefore chosen as a measure of CHW performance in this study. Thus, the classification of the 134 community health workers (CHWs) in Madinani health district into performing and non-performing categories is based on their annual average (2023) coverage rate. In accordance with the 80% target set by the NGO Muso, CHWs with an annual average greater than or equal to 80% are defined as performing, while those whose average is strictly less than 80% are

considered non-performing. Regarding the independent variables (individual, socioeconomic and contextual), a questionnaire validated by the departmental director of health of Madinani was developed. This questionnaire allowed the individual collection of the necessary data. From the information collected, qualitative and quantitative explanatory variables were constructed.

2.2. Theoretical Model

To identify the determinants of performance, community health workers (CHWs) were classified into two distinct groups: high-performing and low-performing. Logistic regression was used as the analytical method, drawing on the work of Fletcher Njororai et al. (2021) on factors influencing CHW performance in western Kenya. This methodological choice is also aligned with the approach of Kouassi (2017), who used a simple logistic regression model to explain the determinants of ART discontinuation in Côte d'Ivoire.

By adapting the theoretical model to this research, the model to be estimated can be written as follows:

$$\begin{aligned}\text{Logit}(\text{Performance ASC})_i = {} & \beta_0 + \beta_1\ \text{sexe}_i + \beta_2\ \text{age}_i + \beta_3\ \text{year\_XP}_i + \beta_4\ \text{education}_i + \beta_5\ \text{taille\_men}_i \\ & + \beta_6\ \text{formation}_i + \beta_7\ \text{sup\_sup}_i + \beta_8\ \text{collab}_i + \beta_9\ \text{sup\_espc}_i + \\ & \beta_{10}\ \text{sup\_dst}_i + \beta_{11}\ \text{year\_XP}^2{}_i + \varepsilon_i\end{aligned}$$

β0 represents the constant; β1 to β11 are the associated parameters for each variable. εi is the error term, capturing the variability not explained by the model (noise, omitted variables).

Gender: The gender of the CHW helps us confirm or refute the fact that being a female CHW is negatively correlated with performance, Ngilangwa & Mgomella, (2018).

Age: The age of the CHW. This variable aims to determine whether the CHW's age (over 45 years old) or age (18 to 44 years old) has a relationship with their performance. (Tripathy et al., 2016) also showed that age is significantly associated with motivation and therefore performance.

Year XP: Number of years of experience. This variable examines the effect of years of experience on the performance of the community health worker. The reference year is 2023, when the NGO Muso began its activities with the recruitment of 134 CHWs.

Education: The level of education used to recruit community health workers. This variable allows us to determine whether we are in agreement with the view that a high-performing community health worker is one with a higher level of education, according to Musoke et al. (2019).

Household size: We believe that the size of the CHW's household can influence their performance. Household size can motivate the CHW by seeking financial means to cover expenses or demotivate them if these people do not allow them to be sufficiently available for work.

Training: Number of training sessions completed. The number of training sessions completed is a variable that also determines the performance of the community health worker (Musoke et al., 2019). sup_sup: The dedicated supervision variable, which indicates the supervision of supervisors dedicated exclusively to CHWs, allows us to see the impact of this so-called dedicated supervision on the performance of the community health worker.

Collab: Collaboration with the health facility to which the CHW is attached, which allows us to determine the effect of collaboration between health center staff and the CHW on their performance. sup_espc: ESPC supervision, which indicates the supervision of dedicated supervisors for ESPCs.
Sup_dst: District supervision, which indicates the supervision of dedicated supervisors for health districts.

2.3. Model Specification

The objective of this study is to analyze the determinants of community health worker (CHW) performance. Performance, defined as the achievement of the operational objective set by the NGO
Muso (coverage rate ≥ 80%), constitutes the dichotomous dependent variable. It takes the value 1 if the CHW is classified as performing well and 0 if it is classified as not performing well, thus reflecting the distinction between workers who achieve the objective and those who do not.

3. Results and Interpretation

3-1. Descriptive Analysis

The sample included 134 active community health workers (CHWs) in Madinani health district. Of these, 71 CHWs (53.0%) were classified as high-performing, while 63 CHWs (47.0%) were identified as low-performing based on the operational coverage criterion (≥80%). The gender distribution reveals a significant male overrepresentation: men constituted 66.42% of CHWs (n = 89), compared to 33.58% of women (n = 45). The following table describes the variables used in this research.

Table 1: Descriptive analysis of variables

Variables	Coding	Frequency or average /Percentage or min. et max.
Dependent Variable		
CHW performance	0 = non efficient 1 = efficient	63 47.01% 71 52.99%
Dependent Variables		
Gender	0 = female 1 = male	45 33.58% 89 66.42%
Age	1 = less than 45 years old 2 = 45 years old and more	71 67.91% 43 32.09%
Year_XP	continuously	7.85 [1−28]
Education	1 = primary school level	43

Variables	Coding	Frequency or average /Percentage or min. et max.
	2 = grammar school level and more	32.09% 91 67.91%
Household size	continuously	8.86 [0−21]
Number of Trainings	1 = less than 5 2 = between 5 and 10	59 44.03% 75 55.97%
Sup_sup	Continuously from 1 to 10	8.98 [1−10]
Collab	1 = unsatisfied 2 = satisfied	40 29.85% 94 70.15%
Sup_espc	0 = no 1 = yes	30 22.39% 104 77.61%
Sup_dst	0 = no 1 = yes	52 38.81% 82 61.19%

Source: Author, based on study data

The quantitative variables year_XP, household size, and sup_sup, the means are respectively 7.85 years; 8.86 individuals; and 8.98 points. The minimum number of dependents is 0 and the maximum number is 21. The minimum year of experience is 1 year and the maximum year is 28 years. As for dedicated supervision, the minimum point is 1 and the maximum is 10.

For ESPC and district supervision, 22.39% of CHWs have never been supervised by their ESPC and 38.81% have never been supervised by the health district. CHWs whose age is less than 45 years represent 67.91% of the population (91 individuals) and those whose age is greater than or equal to 45 years represent 32.09% of the population (43 individuals). 59 CHWs, or 44.03%, received less than 5 training courses and 75, or 55.97%, received at least 5 training courses. Regarding the level of education, the class of CHWs having reached or exceeded middle school is the largest (67.91%), representing 91 individuals, followed by that of primary school (32.09%) with 43 individuals. Regarding collaboration with the ESPC team, 40 of the CHWs are dissatisfied, or 29.85%, compared to 94, or 70.15%, who are satisfied.

4.2. Econometric Analysis

This section presents the results of the logistic regression and other post-estimation tests of the model. The model is generally significant because its

probability is below the 1% threshold (0.0070), meaning that at least one retained independent variable explains the dependent variable. The empirical logistic estimate is:

Logit (ASC Performance) = -2.33 +1.03 sex - 1.32 age -0.20 year_XP -0.82 college +0.08 size_men 0.14 (more than 5 trainings) +0.36 sup_sup -0.36 sup_espc +0.42 sup_dst-0.83 satisfied collab +0.008 year_XP

Gender, household size, and dedicated supervision positively influence community health worker performance. However, years of experience and age (45 years and older) negatively influence community health worker performance.

Table 2: Logit Results on the Determinants of CHW Performance

	Logistics regression models	
	Coefficient (Z-stat)	**Marginal effects (Z-stat)**
Gender		
Female	*Reference modality*	
male	1.0356** (2.02)	0.2120** (2.13)
Age		
18 to 45 years old	*Reference modality*	
45 years old and more	-1.3203** (-2.37)	-0.2708*** (-2.61)
Years of experience		
Year_XP	- 0.2092** (-2.09)	-0.0428** (-2.22)
Education		
Primary school level	*Reference modality*	
Grammar school level and more	-0.8299 (-1.68)*	-0.1653* (-1.81)
Household size		
Household size	0.0831** (2.00)	0.0170** (2.12)
Number of trainings		
Less than 5	*Reference modality*	
More than 5	-0.1467 (-0.35)	-0.0298 (-0.35)
Dedicated Supervision		
Sup_sup	0.3680** (2.44)	0.0753*** (2.65)
Collaboration with the ESPC		
unsatisfied	*Reference modality*	
Satisfied	-0.8332 (-1.64)	-0.1684* (-1.74)
Supervision of the ESPC		
Sup_espc	-0.3637 (-0.66)	-0.0744 (-0.67)
Supervision of the district		
Sup_dst	0.4218 (0.92)	0.0863 (0.93)
The square of the year of experience		
Year_XP^2	0,0082** (2,00)	0,0016** (2,12)
The constant	-2.3385 (-1.70)	NA
Reference models Modality	The CHW Performance	Variation of the performance in relation with the variable
Number of remarks	134	134
LR Chi2 (11)	25.79	Non Appliable
Prob>chi2	0.0070	Non Appliable
Pseudo R^2	0.1392	Non Appliable

Source: Author, based on study data

*Note: *** significance at the 1% level; ** significance at the 5% level; * significance at the 10% level.*

The "gender" variable is statistically significant at the 5% level. The results show that gender positively impacts CHW performance with a positive marginal effect coefficient (0.2120). This means that, all other things being equal, a man increases the probability of performance by approximately 21.20% compared to a woman. As age increases, the probability of CHW achieving a high level of performance decreases. Our results show that a CHW whose age is 45 years or older loses 27.08% of chance of being efficient compared to a CHW under 45 years old, all other things being equal. This indicates that younger health workers are more efficient or that they are better aligned with the performance measurement requirements which is to cover at least 80% of households in their area during the month.

The number of years of experience is negatively associated with the CHW's performance. The negative marginal effect indicates that an increase of one additional year of experience is associated with a decrease in performance of 4.28%, all other things being equal. However, we note an inverse effect on the probability of performance compared to the square of the year of experience. This shows that the inverse effect of years of experience on performance eventually fades and then reverses after a certain time. This could mean that after a certain threshold, aspects such as wisdom or a better understanding of tasks can compensate for initial decreases in performance.

The results indicate that for each additional member in the household, the CHW's probability of performance increases by approximately 1.70%, all other things being equal. The fact that an increase in the number of dependents is associated with an increase in CHW performance suggests that CHWs with more family responsibilities are more likely to perform well. Dedicated supervision thus plays a key role in creating a structured work environment where community health workers feel supported and guided. This benefits them by strengthening the quality of their work and their motivation. Our results show that it increases the probability of performance by approximately 7.53%, all other things being equal.

As economic implications, we propose the following economic policies that could guide stakeholders (government and non-governmental organizations) in decision-making. For the gender component of CHWs, we propose to establish a certain equity to increase the performance of female community health workers in CHW programs and not to dismiss them out of hand based on the results we have obtained. As for dedicated supervision, we believe it is a good approach to improve the performance of community health workers since they are not health professionals. Also, providers do not have enough time to devote to them, so it would be wise to find people dedicated to their supervision. This type of supervision should therefore be encouraged in CHW programs to ensure good performance of the actors. CHW recruitment should focus on individuals with more family responsibilities, as they are more responsible and motivated to achieve objectives. Regarding age, we propose to recruit CHWs whose age is not excessively higher than 45 years.

Conclusion

Community health workers (CHWs) are a key pillar of health systems in isolated rural areas. Optimal CHW performance contributes to increased access to primary health care. This study analyzes the determinants of CHW operational performance, defined as achieving an annual health coverage rate of ≥80% according to the NGO Muso criteria. The study covers all 134 community health workers (CHWs) in the Madinani health district. Using a logistic regression model, the results reveal that male CHWs have a greater likelihood of performing well than their female counterparts by more than 20%. At the same time, household size also shows that increased family responsibilities motivate CHWs to perform better to ensure the economic stability of their households. Furthermore, dedicated supervision has a positive and statistically significant effect on CHW performance, increasing the likelihood of performance by 7% when it is of high quality, by strengthening the confidence and understanding of the agents. Conversely, CHWs over the age of 45 see their likelihood of performance decrease compared to younger ones, reflecting a decline in motivation, physical, and cognitive performance. To optimize CHW performance, it is proposed to establish gender equity to compensate for the 20% gap in favor of men, to generalize dedicated supervision adapted to the needs of non-health professionals, and to prioritize the recruitment of agents with increased family responsibilities (motivational factor) while avoiding the recruitment of agents over the age of 45. The study, however, acknowledges limitations linked to the declarative bias induced by the hierarchical position of the researchers, to the reduced size of the sample which complicated the identification of significant variables, and suggests for future research an independent collection on a larger sample integrating the analysis of cultural and moral issues.

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