Self-reported tooth extractions and associated factors in quilombola communities in the semi-arid region of Bahia state, Brazil, 2016*

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Abstract

Objective: to estimate the prevalence of self-reported tooth extractions and analyze associated factors in *quilombola* communities in Feira de Santana, Bahia, Brazil. **Methods**: this was a cross-sectional study, with 864 *quilombolas*; association between self-reported tooth extractions (no experience of extraction; ≤5 extracted teeth; >5 extracted teeth), and possible associated factors was estimated using multinomial logistic regression, with a 95% confidence interval (95%CI). **Results**: tooth extractions were self-reported by 82.0% of *quilombolas*, 49.8% of whom had ≤5 teeth extracted and 32.2% of whom had >5 teeth extracted; greater likelihood of tooth extraction was associated with being male (adjusted OR = 1.7 – 95%CI1.1;2.7), working as an unregistered worker (adjusted OR = 2.7 – 95%CI1.3;5.7), being ≥60 years old (adjusted OR = 5.2 – 95%CI1.9;14.1) and reporting having dental caries (adjusted OR = 4.1 – 95%CI2.5;6.7). **Conclusion**: tooth extractions are associated with social vulnerability conditions experienced by the *quilombolas* of the semi-arid region of Bahia state.

Keywords: African Continental Ancestry Group; Health Vulnerability; Oral Health; Rural Population; Ethnicity and Health.

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Introduction

Tooth loss is a sign of social inequities. Tooth loss is one of the worst oral health conditions, given its high prevalence, its relationship with living condition vulnerabilities, and because it represents a potential risk of development of psychological and functional harm in different population groups.[1,2] Notwithstanding progress made with dentistry and the efforts of the Brazilian National Health System (SUS) to guarantee its principles and action guidelines for improving the oral health of the Brazilian population, tooth extraction reflects the existence and negative experiences of mouth diseases, as well as aspects related to delayed seeking of dental services.[3] Hence why the World Health Organization (WHO) considers oral health inequalities to be a priority thematic area for health research and intervention.[4]

A study conducted in 2012, based on data from a national survey of the oral health status of the Brazilian population, identified racial inequities in oral health in all the indicators it analyzed – dental caries, tooth loss, pain and need for prosthesis –, associated with greater social insecurity of the Black population in relation to the White population. Income distribution and access to health care policies are conditions which, probably, contribute considerably to the characterization of the vulnerability of population groups to adverse oral health.[5]

Tooth loss is a sign of social inequities

Recognizing and certifying Black communities as belonging to *quilombos* (settlements originally formed by escaped slaves) is not an easy task, in view of the parameters adopted to do so. Nevertheless, the principal criterion of these measures can be seen to consist of self--definition and perception of belonging to the history of the struggle of *quilombola* (maroon) populations, a fact that results in many discussions and opposing views. In view of this, it is common for the legal classification to be used, as per Article 68 of the transitory constitutional provisions of Decree No. 4887/2003, namely, ¨surviving *quilombo* communities are considered to be those racial/ethnic groups, according to self-attributed criteria, who have their own historical trajectory, specific territorial relations and whose ancestry is presumed to be Black.¨[6]

This is a more comprehensive concept chosen to represent groups with similar forms of social organization and similar histories related to the fight for rights, such as *quilombola* communities or 'Black rural communities'.[7] It should be emphasized that, given the process of slavery experience by *quilombolas*, their rural properties are generally located in very remote regions, since the Black slaves who rebelled against that perverse system chose remote places in which to take refuge.

The populations of these rural communities, when compared to populations forming urban communities, have a higher percentage of decayed and lost teeth,[8] which suggests vulnerabilities related to this group, their formal education and income distribution, access to oral health care policies[6] and to benefits arising from the supply of fluoridated, within a context of lower access to health services.[8,9] Esta situación termina dificultando ofrecer atención de salud bucal a estas comunidades, especialmente, afectando el acceso a los ancianos, que terminan con una mayor cantidad de dientes cariados y pérdida de dientes.[10]

Otro indicador importante en el proceso de análisis de salud de una comunidad es la salud autoevaluada. Los estudios han demostrado que la salud autoevaluada es un predictor independiente de mortalidad en casi todos los estudios de salud de la población.[11]

With regard to oral health, research has demonstrated that self-assessment of one's health status, as well as other indicators of perceived morbidity, has differentiated impacts, depending on the variables used.[12-13]

Studies on *quilombola* oral health are scarce;[14] there are no publications in the literature on this theme in the semi-arid region of Bahia state, for example. In view of the this gap in scientific knowledge and as this is a study of a vulnerable and specific population that lives distant from urban centers and, therefore, tends to have limited access to health services, its objective was to estimate prevalence of self-reported tooth extractions and analyze related factors in *quilombola* communities in the semi--arid region of Bahia state.

Methods

This was a cross-sectional study using a database from the project entitled 'Social determinants of diseases and health conditions in the *quilombola* communities of Feira de Santana, Bahia'.

The study was conducted in the semi-arid region of Bahia state where there are currently 665 surviving *quilombo* communities recognized by the Palmares

Foundation.[15] Specifically with regard to Feira de Santana, the following communities involved in this study have been certified: Lagoa Grande (recognized in 2007) and Matinha dos Pretos (recognized in 2014). Both communities are located in the rural area of this municipality.[15] The formation of *quilombola* communities in Feira de Santana has links with the experiences of slavery dating back to the late 19th century and early 20th century. The two communities were created by Black Africans as an alternative involving resistance and survival from the suffering and violence they had experienced.[16]

The Lagoa Grande *quilombola* community is located in the district of Maria Quitéria, close to the BR116 highway, to the north of Feira de Santana. It is estimated that 12,077 people live in this community.[17] Lagoa Grande was the first *quilombola* community to be officially recognized in Feira de Santana, in 2007 by the Palmares Cultural Foundation.[15]

In turn, the Matinha dos Pretos community has a population of 8,855 people,[17] is also located close to the BR116 highway and was recognized and registered with the Palmares Cultural Foundation for also having originally been a place of refuge for Black people who had acted in resistance to slavery.[16]

It should be noted that the human development indicators (HDI) of the *quilombola* communities in the semi-arid region of Bahia state do not differ from those of this specific group in Brazil as a whole. Eighty thousand of Brazil's 214,000 *quilombola* families are registered with the social assistance protection program known as *Cadastro Único*; and 79.8% of these families are beneficiaries of the *Bolsa Família* Program, but even so 74.7% are in a situation of extreme poverty.[18]

The study population included individuals 18 years old or over who lived in the two communities in question. Individuals in this age range were chosen because they were adults and had legal autonomy to take part in the study. The subjects of the study were selected using systematic probabilistic sampling, whereby the household was the sample unit. The sample size calculation took into consideration the heterogeneity of the expected outcomes and the simultaneity of the multiple events to be measured. The sample size was calculated taking 50% prevalence as a parameter, with estimated accuracy of 5 percentage points and 95% confidence intervals (95%CI), in line with another population-based study conducted in similar communities.[19] Although the sample was stratified by household, the questionnaire was administered individually with those who agreed to take part, even if they lived in the same household.

As such, based on the population size of the two *quilombola* communities, Matinha (N=8,855) and Lagoa Grande (N=12,077), the final calculated sample size was 369 people in Matinha and 373 in Lagoa Grande, resulting in a minimum sample of 742 people. An additional 10% was added to the sample to account for possible losses, resulting in a total final sample of 816 individuals. This number was calculated using OpenEpi statistical software, developed for statistical calculations including sample sizes. Notwithstanding, a total of 864 individuals were interviewed.

A pilot study was conducted beforehand in a Black rural community, known as Olhos D'Água da Formiga, located near to the Matinha dos Pretos *quilombola* community. The pilot study involved 74 adults over 18 years old (10% of the initial sample size of this study) in June 2016, with the aim of assessing the need for changes to the data collection process, so as to minimize the possibility of bias in the main study.

The data used in this study were obtained from a primary source by administering an instrument intended to enable socio-economic, demographic and health status characterization of the study subjects, as well as possible identification of diseases and health conditions. This data collection instrument was based on that used by the survey conducted by the COMQUISTA Project,[20] the objective of which was to describe the living and health conditions of *quilombola* communities in the municipality of Vitória da Conquista. It should be emphasized that the COMQUISTA Project survey used an adapted version of a semi-structured questionnaire for *quilombola* populations from the National Health Survey, duly validated in the survey conducted in the Integrated Region of the Federal District when the model questionnaire was tested. The questionnaire was administered during household interviews with all adult *quilombolas* who agreed to take part in the study.

Self-reported extraction of at least one tooth was the dependent variable defined as the outcome, based on the following question asked of the respondent:

"Have you ever had a tooth extracted? How many?"

The dependent variable was later organized into three categories: no experience of extraction; ≤5 teeth extracted; and >5 teeth extracted.

The independent variables were categorized into two levels.

a) socio-economic and demographic variables
  - age (in years: 18-29; 30-39; 40-49; 50-59; 60 or more);
  - sex (female; male);
  - marital status (with partner; without partner);
  - years of schooling (≤8; >8);
  - monthly per capita income (minimum national wage in force at the time of the study: BRL 880.00);
  - has a job (yes; no); and
  - situation at work (registered worker; unregistered worker).

b) health status variables
  - self-rated health (good; regular; poor); and
  - having had dental caries (yes; no).

Descriptive statistics were used when analyzing the data, with mean values, standard deviation, absolute and relative frequency and confidence intervals. Multinomial logistic regression was used to analyze factors associated with tooth extractions, since the outcome – tooth extractions – was subdivided into three categories. The reference category was 'no tooth extractions'. In the statistical analysis, in the case of variables considered to be possible exposure factors, the best condition was always taken as the reference basis, whereby the best condition was defined based on theoretical knowledge obtained prior to the analyses.

Odds ratios and confidence intervals were estimated for the crude analysis and also for the adjusted analysis. All the variables were assessed in the adjusted analysis, with the 'age' and 'sex' variables being included in the final model, selected based on theoretical assessment and when they showed statistically significant differences between the groups (p value less than 0.05). In all the analyses, a 95% confidence interval and a p value ≤0.05 were used.

The estimates were obtained using version 14.0 of the Stata statistical package (Stata Corporation, United States).

In compliance with ethical principles, the study project was submitted to and approved by the Feira de Santana State University Research Ethics Committee on August 7th 2016 – Protocol No. 57412416.4.0000.0053 –, in accordance with the requirements of National Health Council Resolution No. 466, dated December 12th 2012.

Results

Eight hundred and sixty four adults took part in the study, 484 (56%) of whom lived in Matinha dos Pretos and 380 (44.0%) in Lagoa Grande. All invited individuals agreed to take part and no participants were lost to the study. Mean age in both communities was found to be 42.6±16.9 years. However, mean years of schooling differed: 7 years in Matinha dos Pretos and 6 years in Lagoa Grande.

In both communities over 70.0% of workers had informal jobs, especially those working as plantation hands and farmers. All 864 participants referred to themselves as being *quilombolas* and Black. With regard to monthly per capita income, 81.8% (95%CI79.0;84.3) of respondents had income under one minimum wage (Table 1).

In relation to self-reported tooth extractions, 82.0% stated having had at least one tooth extracted: 49.8% reported having extracted ≤5 teeth, and 32.2% >5 teeth; 18.0% (95%CI15.5;20.8) reported no tooth loss/experience of tooth extraction (Table 1).

The results of the multinomial analysis indicated that being a male adult (adjusted OR = 1.7 – 95%CI1.1;2.7), being over 60 years old (adjusted OR = 5.2 – 95%CI1.9;14.1) or between 50 and 59 years old (adjusted OR = 5.9 – 95%CI2.2;15.9) were factors that showed statistically significant association with self-reported extraction of up to 5 teeth, while unregistered workers (adjusted OR = 2.7; 95%CI1.3;5.7) were associated with extractions of more than 5 teeth. The fact of not working was a protection factor for having lost fewer teeth (adjusted OR = 0.6 – 95%CI0.4;0.9). The odds of individuals with dental caries having 5 or more teeth extracted was four times greater (adjusted OR = 4.1 – 95%CI2.5;6.7) (Table 2).

Discussion

The majority of the *quilombolas* from the semi-arid region of Bahia state self-reported loss of at least one tooth due to extraction. Male *quilombolas*, aged ≥60 or 50-59 years old, who worked without formal job registration, and those who reported having had dental caries, were more likely to have had teeth extracted. Lower prevalence rates have been reported in other studies with *quilombolas* in Goiás state (45.0%)[21] and Rio Grande do Sul state (18.0%),[8] although their

oral health status was measured by means of clinical examination. In another study involving adolescents, adults and elderly people based on the National Oral Health Survey (SBBrasil 2010) database, overall tooth loss prevalence was approximately 32.76%,[1] reflecting the unfavorable oral health status of *quilombola* communities when compared to the oral health status of Brazil's general population.

Furthermore, scientific evidence has demonstrated that rural communities, when compared to urban communities, have a higher percentage of decayed teeth (50.3% *versus* 43.7%), possibly associated with lack of fluoridated water supply and lack of preventive,

educative and restorative dentistry.[8] In this study, strong association was found between the age of people in rural communities in the semi-arid region of Bahia state and tooth extractions, demonstrating that older *quilombolas* have more odds of having tooth loss due to extraction. However, age was not statistically significant in *quilombolas* in Rio Grande do Sul state, with regard to self-perception of overall oral health.[14] It is known that tooth loss prevalence among the elderly in Brazil is high, and among the highest worldwide,[1] which may be explained by the cumulative effect of mouth diseases, as a result of difficulty in accessing dental services to prevent and treat these health conditions, above all in

Table 1 – Distribution of socio-economic, demographic and self-perception of health variables among *quilombolas* of the semi-arid region of Bahia state (N=864), 2016

Variables	N	%	95%CI[a]
Age (in years)			
18-29	220	25.5	(22.6;28.5)
30-39	226	26.2	(23.2;29.2)
40-49	150	17.4	(14.9;20.0)
50-59	100	11.5	(9.5;13.9)
≥60	168	19.4	(16.8;22.2)
Sex			
Female	544	63.0	(59.6;66.2)
Male	320	37.0	(33.8;40.3)
Marital status			
With partner	443	51.3	(47.9;54.6)
Without partner	421	48.7	(45.3;52.1)
Years of schooling			
≤8	667	77.2	(74.2;79.9)
>8	197	22.8	(20.0;25.7)
Has a job			
Yes	520	60.2	(56.8;63.5)
No	344	39.8	(36.5;43.2)
Situation at work			
Registered worker	139	26.7	(22.9;30.7)
Unregistered worker	382	73.3	(69.3;77.1)
Monthly per capita income[b]			
≥1 minimum wage	157	18.2	(15.6;20.9)
<1 minimum wage	707	81.8	(79.0;84.3)
Self-assessment of health			
Good	439	50.8	(47.4;54.2)
Regular	385	44.6	(41.2;47.9)
Poor	40	4.6	(3.3;6.2)
Having had dental caries			
Yes	502	58.1	(54.7;61.4)
No	362	41.9	(38.9;45.3)
Tooth extractions (in number of teeth extracted)			
≤5	430	49.8	(46.4;53.1)
>5	278	32.2	(29.1;35.4)
No tooth loss	156	18.0	(15.5;20.8)

a) 95%CI: 95% confidence interval.

b) Amount of minimum wage at time of data collection = BRL 880.00.

the past. Notwithstanding, it should be emphasized that elderly *quilombolas*, differently to non-*quilombola* elderly, have a higher percentage of decayed and lost teeth, reflecting their greater difficulty in accessing health services, in addition to there being no fluoridated water supply in most *quilombola* communities.[8-10]

Among the *quilombolas* studied, males were identified as being almost twice as likely to have tooth loss than their female peers. Other studies of periodontitis and unsatisfactory tooth brushing, based both on self--reporting[22] and clinical examination,[23] showed their association with males, which may be explained by women being more concerned about their own health.

A study conducted using the SBBrasil 2010 database did not reach the same conclusions.[1] That analysis, conducted on a national level for the year 2010, with the aim of verifying tooth loss in the Brazilian population, found high tooth loss prevalence among females in all age ranges. This discrepancy may be related to *quilombola* women seeking health services more frequently, a fact which, depending on the type of professional practice, may result in overtreatment;[1] geographic differences between the studies may also have influenced this lack of agreement, given that the national study was conducted in urban areas, while this study took place in rural communities.

Table 2 – Multinomial regression analysis, odds ratio (OR), p value and 95% confidence intervals for tooth extractions (reference category 'no tooth loss') and associated factors, among *quilombolas* from Matinha dos Pretos and Lagoa Grande (N=864), 2016

Variables	Tooth extractions							
	Up to 5 extractions				More than 5 extractions			
	Crude OR (95%CI[c])	p-value[b]	Adjusted OR[a] (95%CI)[c]	p-value[b]	Crude OR (95%CI)[c]	p-value[b]	Adjusted OR[a] (95%CI)[c]	p-value[b]
Age (in years)		<0.001		<0.001		<0.001		<0.001
18-29	1.0		1.0	–	1.0	–	1.0	–
30-39	3.2 (2.0;5.0)		3.2 (2.0;5.0)		7.0 (3.2;15.2)		7.0 (3.2;15.2)	
40-49	5.7 (3.0;10.8)		5.5 (2.9;10.5)		30.2 (12.5;72.6)		29.8 (12.4;71.8)	
50-59	5.8 (2.2;15.5)		5.9 (2.2;15.9)		100.8 (33.3;304.7)		101.5 (33.5;307.0)	
≥60	5.3 (2.0;14.3)		5.2 (1.9;14.1)		222.1 (74.7;660.7)		220.4 (74.1;655.7)	
Sex								
Female	1.0	–	1.0	–	1.0	–	1.0	–
Male	1.8 (1.2;2.7)	0.003	1.7 (1.1;2.7)	0.006	1.3 (0.9;2.1)	0.177	1.3 (0.7;2.1)	0.369
Marital status								
With partner	1.0	–	1.0	–	1.0	–	1.0	–
Without partner	1.5 (1.1;2.2)	0.034	1.1 (0.7;1.6)	0.693	1.3 (0.9;1.9)	0.195	0.79 (0.5;1.3)	0.357
Years of schooling								
>8	1.0	–	1.0	–	1.0	–	1.0	–
≤8	1.1 (0.7;1.8)	0.505	1.0 (0.7;1.6)	0.850	0.8 (0.5;1.3)	0.456	0.8 (0.5;1.5)	0.574
Has a job								
Yes	1.0	–	1.0	–	1.0	–	1.0	–
No	0.5 (0.3;0.7)	0.002	0.6 (0.4;0.9)	0.008	1.6 (1.1;2.3)	0.019	0.8 (0.5;1.4)	0.498
Situation at work								
Registered worker	1.0	–	1.0	–	1.0	–	1.0	–
Unregistered worker	1.5 (0.9;2.5)	0.072	1.7 (1.1;2.3)	0.050	3.5 (1.8;6.7)	<0.001	2.7 (1.3;5.7)	0.008
Monthly per capita income[d]								
≥1 minimum wage	1.0	–	1.0	–	1.0	–	1.0	–
<1 minimum wage	1.2 (0.7;2.0)	0.424	1.0 (0.6;1.7)	0.912	0.6 (0.3;1.0)	0.093	0.8 (0.4;1.5)	0.418
Self-rated health		0.660		0.897		<0.001		0.383
Good	1.0		1.0		1.0		1.0	
Regular	1.0 (0.7;1.5)		0.9 (0.6;1.4)		1.8 (1.2;2.7)		1.0 (0.6;1.6)	
Poor	1.2 (0.3;4.6)		0.9 (0.2;3.7)		7.4 (2.1;25.2)		2.3 (0.5;9.0)	
Having had dental caries								
No	1.0	–	1.0	–	1.0	–	1.0	–
Yes	3.0 (1.9;4.3)	<0.001	2.8 (1.8;4.1)	0.000	4.3 (2.8;6.4)	<0.001	4.1 (2.5;6.7)	<0.001

a) Odds ratio adjusted for age and sex.

b) X² test.

c) 95%CI: 95% confidence interval.

d) Amount of minimum wage at time of data collection = BRL 880.00.

Quilombolas working without formal job registration were more likely to have had teeth extracted, compared to those with formal job registration. The pay of informal workers tends to be below the legal minimum wage and, generally, they take less care or precarious care of their health, especially when they return to work early or continue working before their health is fully recovered, either for fear of losing their job or because they need the money.[24]

It was found, however, that not working was a protection factor for having lost fewer teeth. This result was not discussed directly in similar studies.[8,14] Only the study conducted by Kochergin et al.,[25] when considering the 'has a source of income' variable, which could be indirectly related to having a job and working, did not reveal statistically significant association between the 'has a source of income' variable and tooth loss. New studies which take these aspects into consideration are needed.

It is recognized that tooth extraction can be an indicator of social inequity between population groups, given that it expresses a reality of living and health condition vulnerabilities. A study conducted by Guiotoku et al.,[5] based on data from the national survey of the oral health status of the Brazilian population, found higher presence of health conditions and need for dental treatment, such as dentures and pain relief, among Black individuals when compared to White individuals.

This study found that individuals with dental caries had greater odds of having tooth loss. Strong association was expected between self-reported dental caries and tooth extraction given that, according to the specific literature, the main determining factors of high rates of tooth loss, either partial or total, are dental caries and periodontitis.[26,27]

In many countries, dental caries prevalence in different population groups is becoming increasingly lower. However, socio-economically deprived population groups have been shown to have the highest concentrations of dental caries.[28] In this setting, it is valid to highlight that according to diagnosis performed by the *Brasil Quilombola* Program in 2012,[18] 75.6% of the country's *quilombola* familes live in extreme poverty. This explains to a great extent the association between high rates of dental caries in this population and their vulnerable living conditions. Despite government investment targeting *quilombola* communities and despite the creation of 1,536 Oral Health teams, as part of the *Brasil Quilombola* Program, supported by the Health

Ministry's *Brasil Sorridente* (Smiling Brazil) initiative, dental care, prevention and rehabilitation services provided to this population are still insufficient.[18] Furthermore, although the supply of fluoridated water is obligatory in Brazil, it has not yet reached all Brazilians, above all those who live in rural and peripheral areas, leaving many people without this benefit that is of recognized efficacy and significant effectiveness.[29]

Low use of oral health services by *quilombolas* demonstrates the need to increase their availability and quality. As evidence of this reality, a study demonstrated less access to health services and, consequently, less health service use by rural populations.[30] In the case of rural *quilombola* communities, this condition is associated with less availability of services, inexistence of Family Health Strategy teams, large distances to be covered and transport difficulties.[9] This study did not find significant association between self-reported tooth loss and the 'years of schooling' and 'income' variables. Diverging results have however been found by other studies, which found that the more income and schooling decreased, the greater the prevalence of tooth loss.[1] However, low schooling and low income cannot be taken as a basis, since among the *quilombola* populations of Feira de Santana no comparison was made between people with high and low income: all individuals interviewed had low income, some with a little more and others with a bit less. Despite self-assessment of health being a good indicator of population group health status, this variable was not significant in the adjusted multinomial analysis, although the same indicator has expressed important associations with socio-economic, social support and health condition dimensions in epidemiological studies with other *quilombola* communities.[25]

In view of the scarcity of scientific evidence regarding factors associated with tooth loss in *quilombola* populations, this study has contributed to the advancement of knowledge on the issue, and can inform and be used for comparison with future epidemiological investigations of the oral health status of Brazil's *quilombola* population.

We recognize that a limitation of this study is the absence of dental examination and this fact reduces the robustness of the data collected, in addition to the limitations inherent to analysis of variables generated via self-reporting. Oral health status, when self-reported, may underestimate or overestimate associations, to the extent that the need exists for participating individuals to have prior knowledge of what dental caries and

periodontal disease are, for example. A more accurate assessment, undertaken by a dental surgeon, or based on the participants' dental records, could generate more concrete results about tooth loss resulting from tooth extraction.

Tooth extraction among *quilombolas* in the semi-arid region of Bahia state appears to be related to the social vulnerability of these communities. The results found point to the conditions to which surviving *quilombo* communities are exposed – and vulnerable – in the semi-arid region of Bahia state with regard to their oral health. As such, even with the evident progress made following the implementation of public policies, such as the *Brasil Quilombola* Program, much still needs to be done

for the preventive and rehabilitative oral health of this population.

Authors' contributions

Araújo RLMS and Araújo EM contributed substantially to the conception and design of the study, gathering data and analyzing the results, writing and critically reviewing the manuscript. Miranda SS, Chaves JNT and Araújo JA contributed to data interpretation, writing and critically reviewing the intellectual content of the manuscript. All the authors have approved the final version of the manuscript and are responsible for all aspects of the work, including the guarantee of its accuracy and integrity.

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