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Letter to the Editor

High prevalence of hepatitis B and syphilis in illegal gold miners in French Guiana

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To the Editor

Viral hepatitis and syphilis remain important public health issues because of chronic forms and clinical complications. The omission of hard-to-reach and disadvantaged populations from public health and medical research is one of the current barriers to achieve the WHO target of reducing the burden of viral hepatitis and syphilis by 2030 [1]. Illegal gold miners in French Guiana, a French overseas territory in South America, are a perfect example of this type of population: they comprise about 10 000 people from Brazil living in a remote mining camp in the rainforest. We have previously shown that gold miners are a vulnerable population, notably with a human immunodeficiency virus (HIV) prevalence of 1.4% (95% CI 0.29–2.56) in a context where prostitution is frequent and condom access is difficult [2]. This study, nested in the Orpal study conducted in 2015 (NCT02903706) [3], aimed to estimate the prevalence of hepatitis B (HBV), D (HDV) and C (HCV) viruses, and syphilis in the specific population of illegal gold miners in French

Guiana. The data collection method was previously reported [3]. Subjects provided informed consent. This ancillary study was approved by the Cayenne General Hospital Ethics committee.

Hepatitis B surface antigen (HBsAg), hepatitis B e-antigen (HBeAg), anti-hepatitis B core (HbC) antibodies, anti-HCV antibodies and anti-treponema antibodies were investigated in the 416 Orpal sample collection (one sample per participant) Fig S1. The non-treponemal test, RPR Charbon, was performed on samples that tested positive for anti-treponema. HBsAg-positive samples were tested for HDV. HBV DNA and HCV RNA were assessed on seropositive samples (laboratory investigations are described in the supplementary material, Appendix S1). Prevalence of HBV was based on the presence of HBsAg and HCV prevalence was based on the presence of anti-HCV antibodies. A 'probable active' syphilis infection was defined as a positive serology on both treponemal and non-treponemal tests.

Among the study population, the HBV-prevalence was 4.6% (95% CI 2.6–6.6) (Table 1). Among the 19 HBsAg-positive samples, five (26.3%) were also positive for HBeAg and HBV DNA was detected in six participants (31.6%) (see Supplementary material, Table S1). Anti-HbC antibodies were found in 115 participants (27.6%). All HBsAg carriers were negative for anti-HDV antibodies. Three individuals (0.7%, 95% CI 0.1–1.5) were tested positive for anti-HCV antibodies, two with detection of HCV RNA. Concerning syphilis, 48 individuals had positive treponemal serology (11.5%, 95% CI 8.5–14.6) (Table 1). Three of them were also tested positive using the RPR test (dilution titre 1/4; representing 0.7% of the whole study population (95% CI 0.1–1.5)), suggesting a possible active or recent syphilis infection. Women were more tested positive for syphilis than men (17.9% versus 8.9%). No HBV/HCV co-infection was detected in this population, neither HIV/HBV nor HIV/HCV co-infection [2]. No woman reporting sex work carried HBsAg or HCV antibodies. Three had positive treponemal serology (3/11, 27.3%) with negative RPR tests, with no statistical difference with women not declaring sex work (19/112, 17%, *p* 0.310).

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Table 1
Characteristics of the population according to serological status for HBV, HCV and syphilis

	HBsAg			Anti-HCV antibodies			Treponemal test		
	Positive <i>n</i> (%)	Negative <i>n</i> (%)	<i>p</i> -value ^a	Positive <i>n</i> (%)	Negative <i>n</i> (%)	<i>p</i> -value ^a	Positive <i>n</i> (%)	Negative <i>n</i> (%)	<i>p</i> -value ^a
Sex									
Female	5 (4.1)	118 (95.9)	0.751	0 (0)	123 (100)	0.348	22 (17.9)	101 (82.1)	0.009
Male	14 (4.8)	279 (95.2)		3 (1)	290 (99)		26 (8.9)	267 (91.1)	
Age									
≤37 years old ^b	7 (3.3)	203 (96.7)	0.224	0 (0)	210 (100)	0.121	11 (5.2)	199 (94.8)	<10 ⁻³
>37 years old	12 (5.8)	194 (94.2)		3 (1.46)	203 (98.5)		37 (18)	169 (82)	
Place of birth									
Brazil	19 (4.9)	372 (95.1)	0.259	3 (0.8)	388 (99.2)	0.830	47 (12)	344 (88)	0.224
Other than Brazil	0 (0)	25 (100)		0 (0)	25 (100)		1 (4)	24 (96)	
Time spent in gold-mining activity									
≤10 years ^b	10 (4.1)	235 (95.9)	0.570	0 (0)	245 (100)	0.069	25 (10.2)	220 (89.8)	0.308
>10 years	9 (5.3)	162 (94.7)		3 (1.8)	168 (98.2)		23 (13.5)	148 (86.5)	
Sex work activity (among 123 women)									
Yes	0 (0)	11 (100)	0.474	0 (0)	11 (100)	NA	3 (27.3)	8 (72.7)	0.395
No	5 (4.5)	107 (95.5)		0 (0)	112 (100)		19 (17)	93 (83)	
HIV status									
Positive	0 (0)	6 (100)	0.589	0 (0)	6 (100)	0.957	1 (16.7)	5 (83.3)	0.692
Negative	19 (4.6)	391 (95.4)		3 (0.7)	407 (99.3)		47 (11.5)	363 (88.5)	

Abbreviations: HBsAg, hepatitis B surface antigen; HBV, hepatitis B virus; HCV, hepatitis C virus; HIV, human immunodeficiency virus.

^a Chi-squared or Fisher test.

^b Cut-off = median.

The HBV prevalence observed in this specific population was 4.6%—considered as intermediate-high—which was much higher compared with the Americas (0.7%) [1], French Guiana (1.5%–2.3%) [4] and Brazil (<1%, except in specific populations) [5]. In Maranhão, where most of gold miners come from, HBV prevalence was 1.7%. Hence, the high HBV prevalence in the study population does not reflect the HBV situation in their native country but shows that they represent a specific group at risk for HBV. The low level of HBV replication in most of the individuals suggests an inactive chronic hepatitis, whereas treatment would probably be requested for four individuals (HBV DNA >2000 IU/mL). None of the HBsAg carriers were co-infected with HDV although North Brazil and Western Amazon Regions have high levels of HDV prevalence. HDV screening—which is insufficient in French Guiana [4]—must remain systematic. The relatively low prevalence of HCV (0.7%), similar to the Americas [1] and French Guiana (0.67%–0.7%) [4], is less than in North-East Brazil (1.7% and 3.4%) [6]. Hence HCV does not seem to be a specific issue in our study population.

Syphilis prevalence in the Americas is estimated at 0.41%, which is less compared with our study population (0.7%). The low RPR titres suggest an early syphilis infection or, more probably, recovery from a recent syphilis, maybe through self-medication with antibiotics—frequent in mining sites—because numerous antibiotics have spirocheticidal action.

High levels of HBsAg and syphilis prevalence could be linked to prostitution, which is common on mining sites. The expensive price of condoms (about US\$10 per unit (unpublished data)) may hamper their use. These prevalences were not higher in women declaring sex work but the small sample size and the probable under-declaration due to stigmatization [2] do not allow us to exclude a link between sex work and these infections.

Some actions should be implemented in the specific context of illegal gold miners living in French Guiana, such as systematic screening in care services, proposition of HBV vaccine when appropriate, widespread distribution of condoms, and sexual health education by peers.

In conclusion, our study showed that illegal gold miners working in French Guiana were a hard-to-reach population at risk for HBsAg carriage and exposed to syphilis. Further investigations into associated factors, behaviour and other sexual transmitted

infections, as well as information about hepatitis prevalence in the local population (MaHeVi study, in progress) are needed to adapt prevention and screening strategies, and treatments to this key population.

Transparency declaration

The authors have nothing to disclose.

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Contribution

MD wrote and implemented the protocol with the help of AA, MN and SV. MD and LHM collected the data and the samples. HJ managed the biological collection. AP and ET performed biological analysis. MD, RS and EM analysed the data. All authors contributed to writing of the manuscript.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.cmi.2019.04.023>.

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