Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

	Symptom onset, May 9, 2016	Genital testing, May 12, 2016	Follow-up, May 20, 2016
Blood	+	..	–
Urine	–	..	–
Cervical mucus	..	+	+
Endocervical swab	..	+	..
Genital swab	..	+	..

+=positive for Zika virus. –=negative for Zika virus. ..=test not done at the time.

Table: **RT-PCR Zika virus results**

as man-to-woman or man-to-man transmission.

However, no data are available on the presence of Zika virus in the female genital tract. Thus, the detection of Zika virus in the female genital tract, its clearance kinetics, and its possible persistence would be of utmost importance in the assessment of woman-to-man sexual transmission of the Zika virus, and it could also help clarify the process of mother-to-child vertical transmission.

We describe the case of a woman (aged 27 years) whose Zika virus infection was identified in May, 2016, at the Pointe à Pitre University Hospital (Guadeloupe, France)—an official area of Zika virus outbreak since late April, 2016.

The patient presented with clinical symptoms of fever, maculopapular rash, and conjunctivitis, typical of an arbovirus infection, and recovered within a few days. Molecular tools were used to rapidly diagnose Zika virus infection (RealStar Zika Virus RT-PCR Kit 1.0; Altona Diagnostics GmbH, Hamburg, Germany), and the patient tested positive for Zika virus in the blood sample and negative in the urinary sample.

The patient was monitored for oocyte cryopreservation, because we follow the French Agence de la Biomedecine (ABM) recommendations for infertile patients in Zika virus-infected areas.[5] Her stimulation protocol was then terminated and she agreed to continue with the ABM recommendations of safe sex with systematic condom use.

A genital swab, an endocervical swab, and a cervical mucus sample were collected for RNA Zika virus analysis 3 days after the onset of symptoms; these samples were all positive for the presence of Zika virus RNA. On day 11 after the onset of symptoms, the patient's blood and urinary samples tested negative, whereas her cervical mucus still tested positive for the presence of Zika virus RNA (table).

We report for the first time the presence of Zika virus in the genital tract of a woman who was infected with Zika virus, and its possible genital persistence after its disappearance from blood and urine samples.

Although we have not tested the infectiousness of a locally situated vaginal virus, its very presence in the female genital tract poses notable challenges, implying that sexual transmission from women to men could occur, as is the case for other viral infections. Zika virus presence in the female genital tract also means that vertical transmission from mother to fetus needs to be assessed, since this virus is a member of the Flaviviridae family, which includes hepatitis C, in which vertical transmission from mother to child can occur in up to 10% of pregnancies.

The duration of Zika virus persistence in the female genital tract and its clearance after the disappearance of the symptoms are unknown. Mirroring what was reported in the male genital tract, a possible dissociation between blood and genital samples of RNA results could occur.

Our findings raise the threat of a woman potentially becoming a chronic Zika virus carrier, with the female genital tract persistently expressing the virus RNA. Additional studies are underway to answer those essential questions and to assess what would then be the consequences for women of child-bearing age.

We declare no competing interests.

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Zika virus and the 2016 Olympic Games

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A recent Editorial[1] in *The Lancet Infectious Diseases* used erroneous reasoning to argue that Zika virus poses no worry for the Rio de Janeiro Olympics—namely, that 92% of Zika cases are far away from Rio (wrong: Rio de Janeiro state has 29% of probable

Zika cases, more than anywhere else in Brazil[2]); that campylobacter is more dangerous (irrelevant: so is dynamite); that just three known travellers were infected with dengue virus during Brazil's 2014 World Cup (glib: Brazil's ruinous Zika virus outbreak began with just one infected traveller[3]); and that worrying is pointless anyway because Zika virus is already found in dozens of countries (fatalistic: by that logic it would never be worth intervening to slow a disease's spread). Tastelessly the Editorial opens with a Nazi reference—the *reductio ad Hitlerum* seldom foreshadowing a wise analysis to come—and concludes with this: "Zika virus represents a minimal threat to games visitors".

But how can anyone be so narrow minded to think only about games visitors? Actually Rio's Olympics are a risk to global health, for seven reasons.

First, the Olympics could not be better engineered to spread disease, because they attract visitors from every country in the world—something that no other mass gathering does, not even the World Cup. If visitors become infected, even asymptomatically, and return home to tropical countries having the right mix of *Aedes aegypti* mosquitoes and overladen slums, that could establish local viral transmission, and new outbreaks of microcephalic, brain-damaged children disabled for life.

Second, there are many places this outcome can eventuate. Africa and Asia have *A aegypti* and slums aplenty, and have long had Zika virus, but so far have mostly avoided the post-2013 neurotrophic strains of the virus that are ravaging Brazil.[4] If even a few Olympic travellers introduce those newly evolved strains to those continents, riddled with weak health systems (weaker than Brazil), the outcome could be dreadful.

Third, although the estimated 500 000 Olympic visitors seem an inconsequential drop in the bucket of global travel, consequence has come from much less. Brazil's outbreak is hypothesised to have started with just one infected carrier travelling in 2013 from French Polynesia to the Americas.[3] Not 500 000, but just 329 travellers entered Brazil from Oceania's small islands that year—suggesting that even a very small number of travellers can do damage, if they return to the right setting for the disease.[5] Reasoning much like this, the US Centers for Disease Control and Prevention (CDC) now agrees that the Rio Olympics might put some low-income countries at "a unique or substantive risk [of] mosquito-borne transmission of Zika virus in excess of that posed by non-Games travel".[6]

Fourth, WHO's advice on Zika virus and the Olympics is feeble. Unlike the CDC, which recommends that workers "consider delaying travel",[7] WHO advises both Olympic workers and tourists to carry on with mosquito repellent and condoms—useful, but half measures, as malaria or AIDS prove.[8] WHO also suggests avoiding "impoverished and over-crowded areas [having] poor sanitation"—clueless that much of Rio fits that description.[8] In a show of wishful thinking, WHO reasons that the Olympics pose "very low risk" because cool winter weather in Rio will suppress Zika mosquitoes.[9] Gambling on Rio's weather is irresponsible, particularly this year when climatologists predict a 70% likelihood of above-normal winter temperatures, and just a 5% likelihood of below-normal temperatures.[10] Yet those are the odds WHO is staking global health on.

Fifth, even assuming the Olympics have very low odds of spreading Zika virus globally, that is only half the issue, because if it eventuates, the outcome—new microcephaly outbreaks among children—will be major and devastating. History teaches that it is foolish to disregard low odds, high impact risks—eg, Chernobyl, Eyjafjallajökull, and Fukushima.

Sixth, there are alternatives. The Olympics could be delayed a year or two, pending proof (now lacking) that herd immunity in Brazil is effectively reducing incidence of Zika virus infection. Or the Olympics could be moved, like the 2003 Women's World Cup was as a result of severe acute respiratory syndrome (SARS) in China. That seems overdue, because Zika-linked microcephaly cases already exceed SARS deaths.

Last, one cannot forget health equity. Attending the Olympics is expensive. Those who can afford the *panem et circenses* are the global 1%, and although they do so freely and with informed consent about Zika virus, their poorer compatriots who are not travelling to Rio have no such autonomy, though they bear the greatest risk of microcephalic, brain-damaged babies should infection spread. Once harmed, not a penny of what is budgeted for the Olympics will go to salve or compensate those victims. Making excuses for this sour bargain, as *The Lancet Infectious Diseases* did, is to endorse a monstrous externalisation of risk, with indifference and inequity.

I declare no competing interests.

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Editors' reply

Amir Attaran makes some valuable points in his response to our Editorial on the Zika virus risk associated with the 2016 Olympic and Paralympic Games in Rio de Janeiro, Brazil.[1]

We agree that Rio de Janeiro state has more probable Zika virus cases than any other state of Brazil. However, the 92% figure cited in the Editorial related to the proportion of confirmed cases of Zika virus-associated microcephaly found in the Northeast Region. Latest figures show that 86% of such cases are in the Northeast Region, whereas only 6·6% are in the Southeast Region, of which Rio is part.[2] This disparity between numbers of cases of Zika virus infection and of microcephaly suggests variations in case detection or notification, or, perhaps, that unknown cofactors contribute to manifestation of microcephaly. The only Nazi reference in the Editorial is to a fictional character. We see no issues of taste in accurate description of that character.

The Editorial clearly considers the risk that the games pose for global dissemination of Zika virus, reaching the conclusion that the games represent little additional risk compared with routine travel. By contrast, Attaran contends that "Rio's Olympics are a risk to global health" because, among other reasons, "Olympic visitors have unsurpassed disease-spreading capacity because they come from every country in the world". Fortunately, an objective, evidence-based approach can throw light on this difference of opinion.

In the Editorial we cited a modelling study by Burattini and colleagues,[3] which calculated the risk of Zika virus infection for visitors to Rio during the 3 weeks of the Olympic Games at 1·8 per million tourists. The model was based on the particularly bad 2008 dengue virus (a virus related to Zika and also transmitted by the *Aedes aegypti* mosquito) season in Rio, when new infections peaked at more than 25 000 per week. Some of the same authors have since published an updated estimate of Zika virus infection in August in Rio of about one to three per 100 000.[4] Thus, up to 15 of the 500 000 visitors to the Olympic Games might contract Zika virus, of whom some might carry the virus back to their home countries. As Attaran points out, it takes just one infected traveller to start an outbreak in a country with suitable conditions. Grills and colleagues[5] have assessed the question of which countries are susceptible to ongoing Zika virus transmission resulting from introduction by a single traveller to the games.[5] Four countries—Chad, Djibouti, Eritrea, and Yemen—were estimated to be uniquely at risk because "they do not have a substantial number of travelers to any country with local Zika virus transmission, except for anticipated travel to the Games".[5]

To answer the issue of additional global health risk posed by the games, Grills and colleagues state: "With the exception of four countries, attendance at the Games does not pose a unique or substantive risk for mosquito-borne transmission of Zika virus in excess of that posed by non-Games travel" (note, Attaran misquotes this sentence in his Correspondence). Thus, for the four countries, the games represent a relative increased risk compared with routine travel, but, based on the estimate given above,[4] the absolute risk of any traveller from these countries being infected with Zika virus during the games is miniscule: Grills and colleagues project a total delegation, including athletes, from the four countries of just 79 people.[5]

The debate over whether the Olympic and Paralympic Games will spur global dissemination of Zika virus (and other infectious diseases from similar mass gatherings) can perhaps be distilled into two points of view. First, through rapid, global travel, the opportunities for spread are already so great that additional games-related travel make no meaningful difference, a view supported by the risk assessments described above. An alternative argument is that however small the risk, the potential harm outweighs the benefits of holding the games and the risk should not be taken. But the ultimate conclusion of the latter viewpoint is to ban all travel to and from Zika-affected countries.

In the end, we do not think that any country should be penalised because of a disease outbreak taking place within its territory. Such penalties discourage rapid and complete reporting and ultimately do nothing to aid disease control.

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