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.

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Original Research

Perspectives of public health professionals on border control practices for COVID-19 management in Europe

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ABSTRACT

Objectives: During the COVID-19 pandemic, internal European borders were temporarily re-established to mitigate the outbreak. Much research on pandemic border control measures has focused on quantifying their effectiveness for infectious disease control as well as on their social consequences for cross-border life in the European Union. However, little attention has been paid to the impacts for the practice and organisation of cross-border public health. To address this gap, the present study analysed the experiences and perspectives of public health professionals working in European border regions regarding border control measures in the pandemic.

Study design: Qualitative interview-based study.

Methods: In total, 27 semistructured interviews with public health professionals were conducted in the border regions between Germany, the Netherlands and Belgium. Participants were asked about their perspectives on border control and the spread of COVID-19 in the region. Interviews were performed between December 2020 and April 2021 and carried out in German, English, Dutch and French.

Results: Before the COVID-19 pandemic, borders had become largely invisible with extensive cross-border social life and mobility. Participants were sceptical about the role of cross-border mobility as a pandemic driver and consequently the effectiveness of enforcing border control for reducing the spread of COVID-19 in their border regions. At the same time, participants raised concerns about the negative consequences for the social fabric and provision of cross-border public health.

Conclusions: Public health professionals highlighted the uncertain role of border control measures for regional infectious disease control in border regions. Rather than border control, sustainable cross-border communication and collaboration is crucial to ensure effective pandemic management in border regions.

Introduction

During the COVID-19 pandemic, despite the World Health Organisation recommendations against travel restrictions,[1] border control measures were imposed at an unprecedented global scale to regulate and reduce the spread of the novel virus. Although border control measures varied in their rigidity, they posed significant challenges to the ideals of a 'borderless' European Union (EU), where borders have been systematically dismantled over recent decades.[2] These challenges were particularly evident in European border regions because an estimated 37.5% of EU citizens live in these border areas[3] and, in 2020, almost 2 million EU residents worked across the border in a neighbouring country.[4]

The widespread pandemic resecuritisation of borders across the EU was rather controversial. Advocates justified it as necessary to contain the spread of COVID-19 and protect citizens' health and security.[5] Critics, on the other hand, pointed to international and European laws, disruptions for cross-border life, socio-economic costs and the inappropriateness of nationalistic, rather than collaborative, responses to a global crisis.[6–8] Numerous studies

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have focused on assessing the effectiveness of border controls for COVID-19 management. These studies, largely based on quantitative modelling, have yielded inconclusive and sometimes conflicting findings,[9,10] with some showing that travel-related measures reduced the spread of disease[11,12] and others describing limited or no effects.[13] In addition, the insights provided by modelling approaches have been criticised for lacking 'real-life' evidence and contextual understanding of public health experiences related to border control and cross-border movements.[10,14]

From the beginning of the pandemic, social sciences and public health scholars have reflected upon the meanings and consequences of border control on cross-border realities in the EU. For instance, Novotný and Böhm analysed the experiences of German-Czech cross-border commuters, highlighting the complexities of navigating different national COVID-19 regulations and the lack of cross-border management systems supporting commuters during the pandemic.[15] A similar study by Opiola and Böhm focused on the challenges created by border control measures for cross-border governance in Polish borderlands.[16] Another research by Medeiros et al. argued that 'covidfencing' strategies adopted by many EU countries highlighted the urgent need for improving cross-border cooperation in economic, social, as well as public health spheres.[2]

Although different studies investigated the experiences of EU cross-border commuters and the role of national border policies for the governance of border regions, the present article focuses on the practices, experiences and organisation of cross-border public health. Specifically, the experiences of public health professionals involved in COVID-19 management in the border region between North Rhine-Westphalia (NRW) in Germany, the Netherlands and Belgium were analysed. This study aimed to understand how local public health professionals perceived and experienced border control measures in their border region. By exploring their perspectives, this study provides in-depth, empirical insights on the role and consequences of pandemic border control in a specific European border region.

Methods

Study design and participants

NRW, the Netherlands and Belgium have a shared border of about 500 km and constitute one of the EU's oldest and most integrated internal border areas. For instance, in 2019, 7490 Dutch and 5160 Belgian people worked in NRW.[17] Before the COVID-19 pandemic, public health professionals working in the region had initiated and developed various forms of cross-border collaborations for infectious disease control (IDC), such as notification forms for various infectious diseases and antimicrobial resistance.[18]

During the pandemic, the three countries applied different border control policies, making this border region a particularly rich research setting (Panel 1). To explore the perspectives of public health professionals, an empirical research based on the collection of semistructured interviews with German, Dutch and Belgian public health professionals involved in the local management of the COVID-19 pandemic was conducted. Based on purposive and snowball sampling, participants in relevant border regions from all three countries were recruited via e-mail or phone through the authors' professional networks and participants' contacts. Relevant regions included the NRW districts of Borken, Kleve, Viersen, Heinsberg, Aachen, Euskirchen and Düren, the Dutch provinces of Dutch-Limburg, Gelderland and Twente, and the Belgian provinces of Belgian-Limburg and Liège.

Procedures

Between December 2020 and April 2021, interviews were conducted through video or phone calls. Reflecting the region's linguistic diversity, interviews were held in German, Dutch, French and English by the authors L.D. and A.K. who are native or fluent in the respective language. The interviews were conducted using a predetermined topic guide (Panel 2) focusing on the respondents' perspectives related to the public health management of COVID-19 in their border region, with particular emphasis on cross-border aspects. The topic guide was informed by the main research question of this study and a literature review on cross-border COVID-19 management published between December 2019 and December 2020, which was conducted iteratively by L.D. and A.K. The topic guide was piloted during the first three interviews and refined accordingly.

The interviews were audio recorded and transcribed verbatim. Postinterview peer debriefings allowed for iterative preliminary analysis and assessment of data saturation. Following deidentification, interview transcripts were entered into NVivo 12 (QSR International). The interviews were analysed using thematic analysis.[19] Coding followed the themes covered in the topic guide, with additional themes emerging inductively during the analysis process (Panel 3). Due to the language requirements, L.D. and A.K. separately coded a subset of transcripts; where in doubt, they compared and discussed codes until reaching consensus. Analysis and validation of the analysis were done through discussions among L.D., A.K. and K.H. As an additional validation step, two online group feedback meetings in Dutch and German with the participants were organised; the results from these discussions resulted in adaptation and refinement of the analysis. All quotes cited in the following sections were translated, where necessary, into English by the authors. Quotes (Panel 4) are anonymised by using a letter–number combination (e.g., G1, N2, B3), with the letters indicating Germany, the Netherlands and Belgium, respectively.

All participants provided written informed consent. The study was approved by the research ethics committee of the Faculty of Health, Medicine and Life Sciences of Maastricht University (the approval number is FHML-REC/2021/002).

Results

In total, 38 experts across the three countries were approached to participate in the study; however, 11 declined or did not reply, resulting in a final sample size of 26 interviews and one written reply (11 in Germany, 10 in the Netherlands and six in Belgium). Of the 27 participants, 13 were female and 14 were male. Nine experts attended the feedback sessions. Participants joined the online interview from their workplace or from home. Most respondents worked in different positions for the regional public health services. The remaining participants included general practitioners and staff at public administrations, disaster relief organisations, and COVID-19 test and contact tracing centres. Most respondents held senior positions, although there were also a few participants with junior positions. Interviews lasted between 23 and 86 minutes.

Borders in the pre-COVID-19 pandemic life of the German-Dutch-Belgium borderland

Participants characterised the border regions between NRW, the Netherlands and Belgium as highly interwoven, where nation-state borders were largely invisible in prepandemic everyday life. Interviewees, who are also the residents of border regions, considered borders an 'artificial concept' (N3) and 'only a line on a map' (B1).

Panel 1
Border control policies in North Rhine-Westphalia (NRW) in Germany, the Netherlands and Belgium.

Throughout the COVID-19 pandemic, Germany, the Netherlands and Belgium pursued different and frequently changing border control policies, creating a complex and often confusing situation for border residents and public health professionals alike. While only a very general overview can be provided here, the timeline of measures and their changes in three countries can be found on the website of Interreg Euregio Meuse-Rhine Pandemic.[20]

Border control policies demonstrated a continuum of verifying degrees of limitations for cross-border mobility, with border closure as the most radical measure. The Netherlands opted against border closures but issued negative travel advice, including for Germany and Belgium, and entry bans from select, high-risk areas (e.g. virus mutation areas). While Germany temporarily closed its borders with several of its neighbours, the political will was to keep the Dutch and Belgian borders open. Although Germany, too, issued travel alerts for the Netherlands and Belgium on classifying them as high-risk areas, special emphasis was placed to ensure the seamlessness of essential border crossings and 'small border traffic' (i.e. short trips of <24 hours). Of the three countries in this study, Belgium followed the most restrictive border strategy. In March 2020 and January 2021, the country temporarily and physically (e.g. through barricades) closed its borders for all non-essential inbound and outbound travel for several months. As in Germany, exceptions to ensure travel for essential purposes have been included in the Belgian legislation.

The following example illustrates the complexity around border policies between the three countries. As part of their border management, all three counties introduced various requirements for testing and quarantining. For instance, in December 2020, travellers going from Belgium to the Netherlands by car did not require a negative COVID-19 test. At the same time, when travelling vice versa, a negative test was required if travellers stayed for more than 48 hours in Belgium. For commuters from Germany to the Netherlands, there were no test nor quarantine restrictions in late 2020 and early 2021, whereas commuters from the Netherlands to Germany were required to register in Germany before their arrival and to have a negative PCR or a rapid antigen test taken no more than 48h before arrival.

PCR, polymerase chain reaction.

Panel 2
Detailed interview guide.

1. Introduction and the role in COVID-19 public health management
a. Can you please introduce yourself and explain your current role in the management of COVID-19 pandemic? What are your core responsibilities? Can you elaborate on it? What do you usually do on a daily basis?
2. The role of cross-border travelling in the borderland and specifically during COVID-19, and border-related outbreaks
a. What is the meaning of the border for everyday life of people in this region? Is there a lot of border crossing - examples? Do you yourself cross the border often? For shopping? Visiting friends? For work? To go for a hike? In this region, do people identify with their specific country or is there more like a borderland life, borderland identity, borderland language?
b. Have there been any infectious disease outbreaks in this region in the last decades which involved cross-border transmissions? Can you elaborate on it more? What did this involve? Was it associated with a particular activity or an event? How has it been managed? How did the border affect public health management back then?
c. Do you think borders and cross-border travelling have a role in COVID-19? What kind of role? Can you maybe elaborate and give an example?
d. Did you recognize that the spread of COVID-19 in your region differed from inland territories? How?
e. Are there particular borderland sites where people from different countries often meet? E.g. in Limburg: IKEA in Heerlen, the Shopping Outlet in Roermond? Why these sites? Have there been outbreaks associated with these places? Can you give an example? Do you think it is important to keep a particular public health attention to these sites? Are there some specific public health measures that have already been taken in these sites?
3. Policies for control and management of cross-border mobilities in the context of COVID-19
a. Are there particular policies in place to control/manage cross-border travelling with regards to infectious spread? Can you give an example? Are they helpful? Why (not)? Do you think these policies can and should stop the daily travelling for shopping or visiting friends and relatives?
b. Have there been different public health measures on the other side of the border (mention country)? Which measures differed and how? How did they lead to differences in the spread of COVID-19? Can you give an example?
c. What is your opinion as a public health professional about the use of border closings during the pandemic? And what do you think of these measures as a resident of this region?
d. Have you noticed that closing the border/restricting cross-border travelling in Spring 2020 had an impact on the infection rate? Infection scenario? Can you elaborate on it and give an example?
e. What can the closing of borders in this region mean for control for COVID-19? What type of unintended consequences can occur? For public health? For the daily life of the region? For the economy? For you as a resident?
f. What do you think about the latest policies?
4. The role of digital tools (e.g. tracking apps)
a. Do health professionals like you use any digital tracking apps in your work (e.g. Corona Melder)? Which one? How do you use it? Are these apps helpful in understanding cross-border mobilities in your region? Why (not)? How? Can you give an example?
b. How has the fact that all three countries each developed their own tracking app affected IDC in the border area? Does it make sense that different countries have their own apps? How has this changed after the apps cooperate? Does the app cooperation work in practice?
5. Cross-border collaboration for COVID-19 control
a. Do you have the impression that there are important differences in public health services and IDC in the different countries? Examples (in data infrastructures, organisation, policies ….)?
b. How do you and your colleagues collaborate with public health institutions across the border for COVID-19 management? More or less frequently? Institutionalized/incidental? Are there special platforms, policies or standards to facilitate this collaboration? Depending on personal relationships? Specific difficulties here?
c. Since the beginning of the pandemic, how have these collaborations developed? (More intense? Sharing data? What?) Did they have an impact on IDC and cross-border travelling? What kind of impact?
d. How could collaborations become even better? What is needed?
6. Cross-border data management
a. How do you communicate data about COVID-19 infections across borders? Are there specific platforms, websites? Can you give an example on how you communicate such data? Formally and informally with colleagues from different countries?
b. How did national differences in counting COVID-19 (e.g. COVID-19 deaths) affect cross-border practices of IDC? Example?
7. Recommendations for future public health actions
a. How do you feel about current practices for COVID-19 management with regards to cross-border mobility? What do you think works well? Why? What should be improved? How?
b. What can the three countries learn from each other in terms of (cross-border) IDC?

People and goods cross borders daily for numerous purposes, as many residents live in one country and work on the other side of the border, whereas their children might go to kindergarten or school in the third country. In addition, many border region residents have relatives in care homes across the border. Several participants emphasised the border proximity as being a positive factor in their quality of life by enabling wider choices and opportunities. Examples included making regular use of schools, childcare and health care in the neighbouring country, visiting markets and restaurants, and buying groceries or gasoline where prices are cheapest. However, although borders were perceived as either irrelevant or beneficial for the social life of border region residents, the study participants highlighted that borders

Panel 3
Thematic codes for analysis.

Theme	Sub/themes	Code
Everyday life in border region	Everyday life of a border region, including non-COVID-19 cross-border travelling	Border life
Public health history of border region	Previous outbreaks including the history of cross-border public health communication	Previous outbreaks
Border crossing and COVID-19	Practices and places related to infectious spread	Risks and places
	Clusters of COVID-19	Clusters
	Differences between infectious spread for inland territories and border regions	Borders and inlands
Public health measures against COVID-19	Within country	In-country policies
	Cross-border policies (perspectives to the policies from different countries)	Cross-border policies
	Actions taken to prevent cross-border spread (e.g. border closure)	Actions
	COVID-19 mutations	Mutations
Cross-border collaboration	Collaboration and data exchange across the border	Collaborations with neighbors
	Collaboration and data exchange to non-neighboring countries	Collaborations with non-neighbors
Tracking apps	Tracking apps	Tracking apps
Recommendations for cross-border COVID-19 management	Recommendations	Recommendations

continue to manifest in jurisdictional and administrative matters, for instance, regarding social security for cross-border workers. These juridical and administrative obstacles became much more visible during the COVID-19 pandemic, hindering the potential for cross-border public health collaborations.

COVID-19 cross-border mobility and consequences of border control measures

Public health professionals provided varied accounts regarding the role of cross-border mobility in the spread of COVID-19 in their border regions. A commonly experienced challenge in this regard was the lack of pertinent data, as most public health data were based on country-specific infrastructures that varied in how a 'case' was defined and calculated. However, based on their local and regional pandemic experiences, many experts suggested that cross-border mobility did not play a big role in viral transmission in their region. Most participants did not observe notable spill-overs or virus importation from their neighbouring country and reported that although there were cross-border COVID-19 cases, these did not emerge as the main driver of the local infection scenario.

However, some professionals mentioned border-related movements as an important factor in the infection scenario in their region. They explained this in terms of large differences in COVID-19 incidences between the different sides of the border, whereby lower incidence areas tend to follow the infection trend of the higher incidence area as a result of daily cross-border traffic. At the same time, experts questioned whether it is cross-border mobility as such or different IDC measures that were responsible for higher incidence levels in the neighbouring country.

Many experts argued against the emphasis on borders as drivers of contagion. They explained that mobility, in general, and the resulting social contacts are a cause of infection, but that cross-border mobility is not different nor more risky or more infectious than in-country mobility. Participants challenged the specific focus on border-related movements, whereas in-country movements are largely left unrestricted. Likewise, some participants pointed out that, in their region, virus importation from nearby in-country metropolitan areas probably played a bigger role than importation from across the border.

Several experts questioned the effectiveness of border control measures in Europe. They perceived border closures as political decrees that appear compelling and straightforward on paper but oversimplify lived realities in border regions and contribute little to IDC on the ground. One participant highlighted that IDC measures onsite, rather than at borders, are more important for the reduction of infection levels and thus for the prevention of local clusters. Some participants stressed that border closures are only effective in curbing viral spread if implemented early (i.e. before there are any cases within the country) and rigorously. However, border closures in the study region came too late and could not be enforced with the necessary rigidity as numerous exceptions were necessary to allow people with so-called essential travel purposes (e.g. families, healthcare workers) to continue to cross the borders. Other participants added that even when implemented early, border closures can only delay the introduction and spread of the virus but never stop it in the real-life context of Europe.

Experts' scepticism about border control practices also stemmed from concerns about the enormous social, economic and health costs linked to the tightly interwoven fabric of their border region. Disruptions of cross-border health care emerged as a crucial worry in this context. Public health professionals highlighted that borderland citizens work for as well as make use of healthcare services in the neighbouring country. Border control measures severely impacted residents' ability to seek care or to provide informal care to their relatives across the border. Similarly, several participants mentioned that border control measures hindered the cross-border transfer of patients and ambulance work, raising concerns that these measures could strain previous efforts and progress of established cross-border relations.

Beyond disruptions of borderland life, many participants expres sed worries about the wider symbolism of border control. Experts perceived border control practices within Europe as incommensurable with core European values, such as collaboration, freedom and solidarity. Participants also warned that border-related IDC measures could strengthen right-wing, nationalistic and anti-European ideologies by accentuating the nation-state and demarking people and groups based on national identities.

The crucial role of cross-border collaboration

Participants highlighted the importance of cross-border collaboration and communication for effective public health management of the COVID-19 pandemic. The nature of prepandemic collaborations differed substantially between border regions. In some regions, participants had no or only sporadic previous connections

Panel 4
Representative interview quotes.

Borders in the prepandemic life of the German-Dutch-Belgium borderland	
Extensive cross-border connections	Daily life does not take the border into account. It's *un bassin de vie*, so we go to school, we work on the other side of the border. The attending physician is sometimes on the other side of the border, the mechanic. You have horses on the other side of the border. It is *un bassin de vie*. [B3]
Borders have little meaning in everyday life	We're in the centre of Europe. And a border is in fact a very artificial concept. People may have interests in two countries at the same time. They have work in one country, have relatives in another and go shopping in a third country. [N3]
Benefits of living near the border	If you see that in the leisure area, then I think it is a big deal that the border is perceived as positive for people who also drive over to Enschede from the German side on the weekend or then to Winterswijk, just because of the culture. [G1]
Administrative borders remain	What you do notice about the border, is the difficulty for a Dutchman to work in Belgium. Just as we have a DigiD in the Netherlands, you need an eID in Belgium … I've been working [in Belgium] for a few years now and there are still a lot of programmes I can't open, because I don't have that card. [B2]
COVID-19 cross-border mobility and consequences of border control measures	
Lack of cross-border public health data	You mean: has the fact of having border crossings, has it had an impact on the numbers of the epidemic? I don't have any hard data to measure that. So I don't know how to answer, I can't say yes or no because I don't have the data. My feeling is no. [B3]
Cross-border mobility as pandemic driver	At the moment, there is still a higher incidence in the Netherlands, which was later addressed by more contact restrictions. Yes, I am sure we got some infections from the Netherlands. [G6]
Scepticism about cross-border mobility as pandemic driver	I do not think that crossing the border is the main cause of transmission. After all, the situation for residents living on the Dutch and German side of the border respectively is the same as residents living in two Dutch neighbouring villages. I do not think that the border has much to do with it. [N1] Yes, a political national border was once drawn, but traffic, say, within a country, contributes to spreading as much as border traffic. [B1] We had a handful of cross-border cases with Belgium that were actually of no relevance to our statistics. We rather see that infections are imported from the Cologne-Bonn metropolitan area. [G5]
Border closures are only good on paper	Countering an infection, a pandemic by closing the border is totally ridiculous, it cannot work. In our crisis team, I said it was like trying to prevent basements from being flooded during a storm tide by means of a decree. The best I can do is with sandbags, but I can't do that with a bylaw. [G5] It is natural that after the decision to close the borders one is immediately confronted with the fact that for many citizens it became impossible to lead a normal life, even if they respected the measures. So a whole series of legal exceptions were quickly created. [B3]
Local IDC measures are better	I don't think [a border closure] would have influenced that, but rather the measures that were taken on site. Because it is about reducing the number of infections in the place of residence and then it does not spread further as a cluster. [G6]
Effective only if early	So closing borders, let's say closing borders in May or in April wouldn't have made any sense at all. Restricting mobility in the early stages of the pandemic, for example in February, that would have made sense and would have added much effect on the further development of the crisis, I think. But you need to be fast. It is too late when you close borders when people have been on vacation and return to the Netherlands. [N2] I think closing a border in itself is not going to stop the virus. It can at the most, in my opinion, delay a virus or a transmission or another infectious disease. But ultimately, a pathogen crosses borders. [N3]
Effective only if rigorous	There are too many exceptions. If you look at the legislation, there were always exceptions who was allowed after all [to cross the border] and who wasn't. And then that's not an effective tool. It's simply- we're too mobile for that. [G10]
Everyday life disruptions	I think [the Belgian border closure] was very unhelpful, to be honest. Not going on a holiday is something very different than not seeing your grandchild who's been born, for grandparents for example … And I think they didn't think it through, that there are so many people who actually work across the border or have things going on across the border, which are important and are not stopped because of the COVID-19 pandemic. [N10]
Barriers for cross-border healthcare provision	And if I stop these necessary visits, that is, visits to the doctor, and also prevent the cross-border exercise of the profession, then I create more damage. There are also many Germans who work in the Belgian hospital, for example. All these things, you have to ask yourself, once I close all of this, what happens then? [G3] It was no problem to transport patients by ambulance from Belgium to Germany. It was more difficult in the opposite direction. When the German ambulance was not allowed to cross the border … we sent ambulances to Germany to pick up the patients. (B6)
Socio-economic dependencies	As border areas, we can only benefit if we work closely together. Otherwise we are somehow like 'beaten at the wooden fence' [German expression], I'll say it a bit exaggerated. And that is always unstable enough. In the labour market in particular … That's why you should be a little careful when you have such a border closure. [G1]
Incommensurable with European values	[T]his border closure was consciously perceived here, but more as a blow in our guts with regard to the European idea than as an effective measure to contain infections. [G5]
Nationalistic message	I think it's a shame that, in the end, a nation-state way of thinking was dug up again … I just think there are people everywhere who say we have to start the nation state again and the EU is not that great. [G11]
National identities	[When] I arrived at the [Belgian] border control … I had to show papers. And the way cops look at you because you have a yellow license plate, that's very negative, kind of like- How do I say that? Not at all welcoming really …. It was not immediately accepted when I just showed that I work in [Belgium], I have a paper from the Order of the doctors of Belgium. I have always taken my contract with me to be on the safe side. [B2]

(*continued on next page*)

Panel 4 (*continued*)

Borders in the prepandemic life of the German-Dutch-Belgium borderland	
The crucial role of cross-border collaboration	
Previous cross-border collaborations	So what is good, what also helps us, is a good connection to the Netherlands, in the border regions here, which has been developed for decades. You know each other through various encounters … Of course, this helps as a starting point if such a pandemic actually breaks out that you know each other. [G2] Yes, [cross-border communication] was actually a very big problem in the beginning because we didn't even have any phone numbers for them and didn't even know that they are called GGD [Dutch public health service]. And now it is like this, there is this [name] project … [so] that the border regions get to know each other, that is, at the level of the health authorities. And that way we have phone numbers for the first time. [G9]
Challenges of cross-border work	We cannot exchange data across borders. I have lists of names of people who have been in contact with someone who turned out to be infected, Aachen has lists of names, Heinsberg has lists of names, but we cannot share them. That is not allowed by law. The only official information that can be shared is that an infection has been confirmed. [N5] The system for controlling infectious diseases works quite differently. The Dutch do it quite differently from us in Germany, also on the basis of different legal rules. They work in completely different systems, you cannot say otherwise. [G2]
Existing cross-border collaborations are necessary	I think you need to have established collaborations or collaborative networks based on prior working relationships. I think we haven't gone far enough … that would make things so much easier and so much lower threshold than is the case now. I think we are in a privileged position by having these working relationships, but they could be more intense and could be taken a step further even. [N2] In general, I think that on many issues, we should often work more closely together as local authorities with our Dutch colleagues. If there are more ties, then it is indeed easier to make contact with issues that suddenly arise. [B1]
Importance of working together in border regions	We're living in 2021 and still, it's basically, you just have two separate countries while you can share so much knowledge … Instead of working against each other, Belgium should say, look, we close the borders, we don't want Dutch people in Belgium, make sure there is communication with Dutch people. [B2] I think it is important for us, when the war is over, in peacetime, to learn about the working methods of colleagues across the border. How did you deal with this pandemic? What is the role of the public health service, what role do general practitioners have? Are there protocols you work with? [G5]

with the public health authorities in their neighbouring countries and lacked understanding of how public health was organised across the border. As a result, they encountered many challenges in the management of cross-border COVID-19 cases. For example, when a Belgian doctor who lives in Germany but works in Belgium became infected and had to be hospitalised, the German public health department did not know which Belgian authority to inform nor how to inform the doctor's patients. Another German participant described that reporting cross-border cases to their Dutch counterpart was initially a lengthy process because they did not have a direct phone contact with the Dutch regional public health office.

In other regions, participants could draw on previously established cross-border public health collaborations (e.g. shared notification spreadsheets for certain infectious diseases, previous Euroregional projects, a border-liaison employee and local government contacts). In these regions, participants reported that pre-existing networks helped them reduce the time communicating with their cross-border counterparts. However, even when pre-COVID-19 cross-border channels were in place, participants stated that the contacts were ineffective or insufficiently institutionalised to enable systematic and sustainable collaboration in a pandemic context. A key reason mentioned for the breakdown of cross-border cooperation was that it became deprioritised because compliance with national IDC policies was the primary focus, whereas cross-border aspects were a voluntary 'add-on' for which there were no resources.

Irrespective of whether cross-border channels of collaboration had been in place before the COVID-19 pandemic, participants experienced various difficulties in managing cross-border cases. Experts strongly emphasised that lack of such cooperation is both obstructing IDC and harming the social life of borderland communities. Participants highlighted that cooperation does not have to result in the homogenisation of policies and national systems, which would be unnecessary and unfeasible, but rather, it should be rooted in clear, working channels of cross-border communication.

Discussion

Expert interviews with public health professionals working in the German-Dutch-Belgian border region illustrated the complexi ty of cross-border IDC and highlighted the consequences of border control measures for both the social fabric of borderlands and cross-border public health collaboration. The research setting of this study is characterised by a high level of mobility, and social and cultural integration, which might be not characteristic of other border regions within and beyond the EU. However, lessons learned from this study are important to current discussions regarding the role and consequences of border control measures for cross-border public health work and future outbreak preparedness.

Literature on border control measures to mitigate the COVID-19 pandemic highlighted varied and inconclusive results from modelling and observation studies.[21,22] Research from specific settings, such as Hong Kong,[23] Australia,[24] New Zealand[25] and Taiwan,[26] reported that strict and early border control policies have contributed to significant reductions in the number of COVID-19 cases. Border policies introduced by EU member states raised concerns,[2,8] especially in the very dynamic border regions, such as the one explored in this study. However, rather than looking into the effectiveness of these measures for the containment of COVID-19, the present study focused on the consequences of border control measures for the realities of public health practices and cross-border IDC in a densely populated region.

Echoing research on border closure between two Australian states,[27] the results from the present study pose a crucial question to national and international public health authorities: how to reflect on and integrate the realities of continuous integration and globalisation of the modern world into current national strategies of public health securitisation? In line with various international calls for better international cooperation,[28,29] experts interviewed in this study argued for the building of long-term and sustainable channels for cooperation of public health authorities across borders. Current national practices and policies of IDC often do not consider the cross-border

mobilities that constitute the social life of border region residents. Better understanding and communication about cross-border mobility, rather than prohibition and securitisation, should be integrated into future IDC planning at national, European and global levels.

This study highlighted how border control measures have disproportionately affected the social life of borderland residents who faced difficulties in navigating their cross-border work and family responsibilities. This situation required public health professionals to adopt additional measures and invest extra time towards helping residents navigate the different COVID-19 requirements of the three countries. Although it was argued by state authorities that national border controls were put in place to support the pandemic response, in the highly integrated region of NRW, Belgium and the Netherlands, it created additional work for public health professionals and disrupted previously established cross-border collaborations.

The present study had several limitations. First, a limited number of participants were enrolled, and they were not distributed equally between the three countries. However, the interview data did achieve saturation. Second, the research was conducted between December 2020 and April 2021 during the first year of the COVID-19 pandemic. As the pandemic continues to evolve, it is important to collect and compare public health professionals' experiences relating to the consequences of border control measures from different border regions within and outside of the EU.

The current research highlighted the importance of contextualisation of IDC measures. Working in border regions, participants anticipated difficulties related to cross-border communication and collaboration in the context of a large-scale pandemic. The expertise of public health professionals who have experience and understanding of the dynamics of border regions is essential for addressing the current pandemic as well as for preparing for future outbreaks. Rather than border control, sustainable cross-border communication and collaboration is crucial to ensure effective pandemic management in border regions.

Author statements

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Ethical approval

The study was approved by the research ethics committee of the Faculty of Health, Medicine and Life Sciences of Maastricht University (the approval number is FHML-REC/2021/002).

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Competing interests

The authors declare no conflict of interest.

Data sharing

The data from this study are not available for open access but can be requested directly from the corresponding author.

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