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Open science for health research and innovation in Africa: A call for an 'inclusive' intellectual property rights regime

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Open science offers numerous benefits for health research and innovation that can advance public healthcare in Africa. In addition to facilitating universal access to research results, open science engenders scientific collaboration, accelerating research and innovation. However, the shared entitlement to using and developing intellectual resources in the open science context is challenged by the traditional approach to intellectual property rights, at the core of which is the right to exclude. This article examines the emerging notion of inclusive property rights, an alternative regime that emphasises the right to include and collective entitlements, as opposed to the right to exclude and individual ownership. Under this *sui generis* inclusive property regime, everyone enjoys the rights to use, share, adapt, modify or improve protected creations or inventions stemming from open science. It is suggested that African countries should review their intellectual property legislation to explicitly take into account the notion of inclusive property rights, ensuring that the adoption of open science in health research and innovation is beneficial to the African people.

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The effect of the globalised intellectual property system on access to healthcare and innovation continues to be a subject of concern for Africa and developing countries in general, as reflected during the COVID-19pandemic.[1] Intellectual property rights, such as a copyright and patent, grant creators and innovators exclusive rights over their intellectual creations and inventions to, among other things, enable them to recoup expenses incurred and realise some financial gains as an incentive for initial and further research, development and innovation, particularly in health.[2] However, the exclusivity stifles the sharing and unrestricted access/use of scientific data and other research outputs and results in high monopolistic pricing that puts research products such as diagnostics, vaccines, medicines and related health technologies out of the reach of most Africans.[1,2] Also, new technologies are rarely researched into and developed for diseases affecting millions of people in Africa owing to their relatively low purchasing power, which cannot guarantee high returns.[2] While several flexibilities, including compulsory licencing, are considered mechanisms that could address some of these shortcomings in Africa and other countries in the global south, they have served limited or no use for various reasons, including the fear of economic retaliation, particularly by the global north and low scientific and technological capacity.[3] The gaps in health technology access, research and innovation challenge Africa's public health objectives and commitment to achieving the Sustainable Development Goals (SDGs) and people's right to health. Accordingly, as open science emphasises open, collaborative and inclusive scientific practices to accelerate research and innovation processes while fostering equitable access and use of outputs,[4] it is particularly important to address the health technology access, research and innovation gaps in Africa. Within this context, researchers from diverse disciplines and across the continent can work together to solve the unique healthcare challenges in Africa.

In addition to the UNESCO Recommendation on Open Science 2021, which calls for a prioritisation of Africa's needs, among other issues, there are ongoing continental, regional and national initiatives to promote, formulate and implement open science policies. The African Open Science Platform (AOSP) is currently championing a pan-African response to the open science movement in line with the Science, Technology and Innovation Strategy for Africa 2024 (STISA-2024). Its role includes creating and supporting networks of engagement among scientists and other societal actors in open innovation to address Africa's priority issues, such as disease prevention and control. Similarly, the African Academy of Sciences (AAS), Science for Africa (SFA) Foundation and Africa Research Excellence Fund (AREF) alumni, through their platform, Open Research Africa, support the open access publishing model for scholarly articles and other outputs from research in Africa, including clinical trials. Furthermore, the AfCFTA Protocol on Intellectual Property Rights 2023 recognises open licensing mechanisms and promotes research cooperation and other collaborative models among African scientists. The East African Community (EAC), a regional inter-governmental organisation which comprises the republics of Tanzania, Kenya, Burundi, Uganda, Rwanda and South Sudan, also recently launched the East African Regional Science, Technology and Innovation Policy 2022-2033, containing copious provisions on open science. National governments and institutions are also supporting open science as reflected by South Africa's 2019 White Paper on Science, Technology and Innovation and draft National Open Science Policy, Nigeria's Science, Technology and Innovation Policy 2022 and the Kenya National Open Science Dialogues.

One of the keys to sustaining open science practices in health research in Africa is to align open science principles with the legal frameworks on intellectual property rights. Open science instruments, such as the UNESCO Recommendation on Open Science 2021 and South Africa's 2019 White Paper on Science, Technology and Innovation, acknowledge that intellectual property rights such as patents and copyrights still apply to open science. This is because, in addition to resources in the public domain, the implementation of open science relies on some form of private open licensing arrangements primarily aimed at removing the barriers to access and use obtainable under the traditional intellectual property system. As open licensing derives from the inclusive potential of intellectual property rights, it undoubtedly raises the need to reconsider how the concept of intellectual property rights is understood, defined and interpreted within existing legal frameworks to sustain open science practices in health research and innovation in Africa. Therefore, this article explicates the emerging notion of **inclusive intellectual property rights**. It argues and provides a direction for its integration into the various intellectual property systems in Africa to promote and sustain open science practices in health research and innovation in the continent, particularly regarding publicly funded ones.

Licensing in the open science context and the significance for health research and innovation in Africa

Open science is an inclusive construct encompassing various open movements and practices, such as open source, open access and open data, aiming to open the scientific research and innovation process to everyone and allowing anybody to access, use, reuse, adapt, repurpose and share the scientific products.[4] Underlying the various open movements and practices is the use of the legal instrument of licensing. Particularly, it has been argued that open licensing is at the heart of open movements, such as the free and open source software movement.[5] There is a strongly held view that the free and open source software movement could not have succeeded without the legal innovation embodied in the alternative licensing model adopted.[6] This is because open licensing plays the critical role of ensuring equitable access to resources and inducing participation in follow-on research and development that are open and collaborative by inverting or re-purposing the intellectual property rules to emphasise the users' liberty to access, modify, adapt or distribute intellectual resources rather than the rights of creators or inventors.[7] Although open licensing emerged with the free and open source software movement, there has been an increasing attempt to adopt the licensing model in other contexts, including health, which has given way to a nuanced range of approaches with differentiated degrees of openness. These are exemplified by the Indian Open Source Drug Discovery project, CAMBIA's BIOS (Biological Innovation for Open Society), Medicines Patent Pool (MPP) and Gilead Sciences, Inc. royalty-free, voluntary, non-exclusive licensing initiatives.[8,9]

Open licensing is a private ordering initiative largely founded on existing intellectual property rights.[10,11] With specific regard to health research and innovation, a diverse range of intellectual property protection apply.[3] These include patents, which protect new and inventive pharmaceutical products and medical devices, and copyright protection, which extends to creative works such as scientific publications and presentations, among others.[3] Biological databases and computer programmes used in research and healthcare may also be patented and/or copyrighted, depending on the jurisdiction.[3] In relation to any of these, open licensors can voluntarily assert the right to freely share their works or inventions and create binding relationships with one or multiple licensees based on having obtained intellectual property protection. This is the same way that proprietary rights owners traditionally exercise their intellectual property rights by employing 'closed' licences to restrict users' activities. In other words, as with the traditional licensing approach, the legal enforceability of an open licence is largely dependent on intellectual property protection. However, as opposed to the traditional licensing practices associated with the proprietary model of research and innovation, which provide users with a limited scope of entitlements, particularly restricting users' liberty to use, modify, adapt or distribute intellectual resources, open licenses are designed to promote universal access to and use, modification or adaptation and sharing of resources among users, researchers and other actors.

Nevertheless, it is worth noting that although under the open licensing model, intellectual property rights holders grant users, researchers, developers and anyone (with or without charging a fee) the freedom to use, copy, modify, improve or adapt and distribute their intellectual property, they are not stripped of their exclusive rights granted under the appropriate intellectual property regime – copyright and/or patent – but have merely declined to exercise it.[12] This is as opposed to placing in the public domain works or innovations that are not subject to intellectual property protection or for which the intellectual property rights have been relinquished or have elapsed.[3, 11] More significantly, while an innovation or creation, such as bioinformatics software, can be placed in the public domain, enabling disclosures, such as source codes and laboratory notes, may not be available. Yet, such enabling disclosures are a core feature of the open licensing framework.[12] Besides, the utilisation of some form of licensing provides clarity to users as to how resources may be accessed, used, adapted and shared.[13] It also allows the intellectual property holder to maintain some level of control, the purpose of which is to ensure universal and sustainable access to, use, modification and distribution of their creations or inventions.[11] By this means, open licensing allows intellectual property holders to dictate the scope of usage and conditions for derivatives of their patented or copyrighted materials and ensure proper attribution, thereby preventing misuse/abuse while ensuring their visibility, accessibility and optimal utilisation.

Leveraging open licensing in open science is particularly important in addressing the health challenges in Africa, as it could ensure access to research outputs, data, methodologies and other resources crucial to advancing health research and innovation. By minimising the barriers to accessing, using, adapting and sharing existing scientific knowledge, data, methodologies and others, open licensing can also spur collaborative health research among researchers, innovators and other open science actors at the national, regional and continental levels and thereby induce rapid technological innovation. Additionally, open licenses lend a considerable level of certainty regarding the status, access and use of existing resources while mitigating production costs and the high transaction costs associated with negotiating and obtaining licences under the traditionally closed proprietary model.[14] This could further ensure access to

affordable and quality end products, like medicines and vaccines, since any body or firm could develop, manufacture, distribute and market the open science outputs.

It is worth noting that as health research and open science practices require substantial financial, temporal and intellectual investment, it brings to the fore the issue of incentives and rewards for open licensing, especially with regard to intellectual property based on privately funded research and innovation. In this respect, a combination of social considerations and future monetary rewards are identified among the main drivers of open science/open licensing.[15] Granting open licences demonstrates a commitment to corporate social responsibility and can enhance the open licensor's reputation. For example, a pharmaceutical company that opens life-saving medicines for low- and middle-income countries can benefit from public goodwill and trust. As a biopharmaceutical company, Gilead Sciences grants of royalty-free voluntary licences to pharmaceutical manufacturers to enable them to make and sell generic versions of their medicines for low- and middle-income countries could enhance its reputation globally.[8] It also helps intellectual property owners to create or expand markets for their technology. For instance, licensing a foundational technology openly can ensure widespread adoption and stimulate demand for consulting, customisation or advanced versions of the licensed material, and complementary products or services controlled by open licensors. In addition, open licensing fosters ecosystems where other entities contribute improvements or create interoperable technologies from which open licensors may benefit. By all these actions, open licensing potentially provides a win-win strategy for intellectual property owners and society. Nevertheless, there continue to be calls for developing incentives and rewards for open science practices by contributors to the discourse.[3,16]

Common features and types of open licensing

While open licenses are many and may vary in certain technical respects, they share certain features that promote science as a global public good, at the core of which is the shared use of proprietary material.[17-19] These features, as exemplified by the established standard open licenses of Creative Commons,[19] Open Source Initiative[20] and the Free Software Foundation,[21] can be broadly classified into three groups. One such feature is that an open licence is non-discriminatory in that it permits the usage of licensed materials by anyone or any licensee for any purpose.[17-19] The use of the licensed material may be individually or collectively exercised, whether for commercial or non-commercial purposes. A second key feature is that an open licence must grant users or licensees permission to change, adapt, modify or improve the licensed materials; otherwise, it cannot be considered open.[17-19] In other words, in addition to access and usage of licensed materials, open licensees can adapt or modify them for any reason without being required to seek additional permission from the intellectual property holder or licensor. Third, an open licence must not restrict users or licensees from distributing modified or unmodified versions of the licensed material, either *gratis* or for a fee 'to anyone anywhere'.[17-19] In this vein, the licensee must not be required by the licensor to seek additional permission or to pay a royalty for the purpose of distribution.

The three underlying features of open licences are sacrosanct in promoting users' freedom, minimising barriers to access and incentivising collaboration/contribution from potentially large and diverse users and innovators, thereby inducing rapid innovation and maximum utilisation of resources. For healthcare in Africa, these acquire profound significance as medicines and other medical products initially developed for and clinically tested on a population in a different continent, such as America, Europe or Asia, may need further research and modifications to ensure their efficacy and prevent adverse reactions among Africans owing to genetic variation. However, these distinct features of open licensing also present challenges that could impact patient safety if not properly managed. While multiple entities manufacturing, modifying and distributing medicines and medical products under open licences ensures competitive prices and broad access, it increases the chances of variability in their safety and efficacy, especially in low-income and middle-income regions like Africa with weak regulatory systems.[22] Strengthening the regulatory framework is, therefore, critical in this regard. An open licence may impose additional rules if they do not conflict with the three main features or constrain users' freedom to access, use, modify, adapt and share the licensed material.[17,18] For instance, rules seeking to protect the integrity or moral rights of the initial author/inventor of a licensed material by requiring that modified versions carry different name(s) or version number(s) from those originally licensed are considered compatible.[17,18] Significantly, open licences can require adherence to specific health regulatory requirements and approvals. Gilead's royalty-free, non-exclusive, voluntary licensing model offers a useful example in this regard.[8]

Beyond the shared features, open licences can be broadly classified into two categories: copyleft and non-copyleft licence. Copyleft or reciprocal licences do not only grant licensees the freedom to use, modify and share licensed materials (with or without modifications) but also oblige licensees to pass along (in the course of distributing the licensed material, whether modified or unmodified) the same freedom they enjoyed to third parties by using the same form of open (copyleft) licence.[23] This arrangement creates a 'viral' effect in that once a material is distributed under a copyleft licence, copies of the original material and subsequent improvements or modifications will continuously be shared unencumbered.[11] Reliance of copyleft licence on reciprocity or **grant back** principle could give rise to a **protected commons** or a common pool of proprietary materials that are equitably and universally accessible to anyone around the world who agrees to the terms of the licence and, in effect, inaccessible to those who do not. A protected commons grows as participants contribute their improvements back to the pool, which also serves as building blocks for further 'free' or 'open' research and innovation. Popular examples of this kind of licence are the General Public License (GNU GPL)[21] and Creative Commons ShareAlike License (CC BY-SA).[19]

On the other hand, under non-copylefted or permissive licences, the licensee is permitted to add restrictions to the modified versions or derivatives distributed to third parties by adopting other forms of licences, including proprietary (non-free and open) licences, notwithstanding that copies of the original licensed material were distributed free by the licensor.[23] This means that materials distributed under this form of licence can be used by proprietary developers or combined with proprietary resources to develop derivative or improved proprietary inventions or content, as the need to grant back to the community does not arise. In this respect,

non-copylefted licences share some similarities to the public domain, primarily as they do not impose reciprocity. However, by turning the subsequent improvements and derivatives proprietary, third parties are denied the same freedom the original licensor had granted the licensee or follow-on innovator. This form of licensing is exemplified by the BSD (Berkeley Software Distribution) licence.[20]

Although copyleft licences and non-copyleft licences both allow users to freely use, study, adapt, modify and share licensed materials, they differ significantly in the conditions placed on improvements or derivatives, as discussed above, each having its own advantages and disadvantages. Consequently, their applicability depends on the goals of open science projects. Arguably, non-copyleft licences are suitable for open science projects prioritising widespread use and adoption of licensed works or inventions. In healthcare, non-copyleft licences can be adopted in Africa to expedite the development, manufacturing and marketing of consumables like medicines and vaccines. Its flexibility, allowing users, particularly manufacturers, to integrate openly licensed resources with their proprietary resources, could engender healthy competition, leading to affordable and quality medicines and other consumable health products. Because non-copyleft licences do not obligate grant-back improvements to the community, they are often more attractive to businesses. However, the private appropriation of improvements or derivatives of openly licensed innovations and works may limit their broader diffusion and exploitation for the public good.

On the other hand, copyleft licences are best suited for open science projects prioritising collaborative research and development activities, follow-on innovation and communal sharing of resources, including improvements or derivatives. Besides supporting the exploitation of economies of scale in research and development, copyleft licensing is a potent means through which countries at a disadvantage can access the research and development capabilities of others on the continent. The virality of the copyleft licence prevents private appropriation by persons who would make modifications for proprietary purposes, ensuring that future creations or inventions building on the licensed material remain openly accessible as a common good.[24] This is critical for publicly funded research and promoting and sustaining open science practices among health researchers and other actors at continental and global levels. Although less attractive in commercial settings, it incentivises contributors in community-driven research and development as they know that market players cannot privately hijack their contributions or the overall open science project.[10]

Open science, as highlighted, envisages a shared entitlement to using and creating resources in common, with no specific person or entity excluding others. While the various forms of open licensing have sought to capture this non-excludability principle, their reliance on the existing intellectual property rights for strength is problematic on many grounds.[10,25] Among others, it is subject to the will of the intellectual property rights holders, which creates uncertainty as it cannot be established from the start whether they will choose to openly license the intellectual property or change their mind and revoke the open license.[3,10,25] Similarly, there are concerns that intellectual property holders, particularly market players, may impose very restrictive terms on users under the guise of open licensing.[25] There are further concerns regarding the enforceability of open licensing contracts, particularly the legal entitlements of users, against third parties, especially when they gain access to intellectual resources without directly contracting with the right holders.[10] As noted, 'such reliance on contract results in privileges only effective against the licensor, or the copyright or patent owner. They are not rights against the world as property would be'.[11,26] Hence, users may have no remedy against third parties encroaching on their inclusive entitlement, say through intellectual property claims on improvements or derivatives. While copyleft licensing aims to ensure that improvements of licensed materials remain openly accessible, the original intellectual property owner may lack the incentive or resources to enforce these provisions. Dusollier[11,26] and Elkin-Koren[10] offer a detailed analysis of some of these complexities in their works, highlighting how the sustainability of open licensing schemes, particularly copyleft licensing, is challenged. Besides, the costs of obtaining patents and the delays between patent applications and grants impact the sharing of inventions through open licensing.[14]

Bearing the foregoing issues in mind, the following section of this article offers an in-depth analysis of the emerging notion of inclusive proprietary rights espoused by Dusollier, Van Overwalle and others, advancing its legal recognition in the context of open science to address existing health research and innovation challenges in Africa.

The notion of inclusive proprietary rights

In the wake of the open movements, several studies drew attention to the two-sidedness of the existing intellectual property regimes.[11,14,27-29] While in the traditional sense, intellectual property laws confer the right to exclude on right owners, they implicitly give them the right to include. This right to include is exercised through open licences, providing the current underlying legal basis for the use of intellectual property in the global open science movement. However, to address the inherent limitations under the current intellectual property regimes with regard to the sustainability of open collaborative research and innovation practices, there have been some attempts to broach the idea of 'inclusive intellectual property rights' as a *sui generis* legal regime.[11,14,26,27] Dusollier[11,26] and Van Overwalle[27,30] conducted a series of research in this regard. They both believe that a reasonable legal approach to achieving a universal, enforceable and sustainable open research and innovation model is through the institutionalisation or legal recognition of the inclusivity or inclusive entitlement engendered by open licensing and other commons regimes.

An inclusive intellectual property right is a form of right exercised in a collective and shared manner, with no person or persons having the power to claim control over the intellectual resource to the exclusion of others. More particularly, the notion of inclusive intellectual property right or inclusivity is seen by van Overwalle[27] and Dusollier[26] as that which confers on the right holder(s) the right to include only, with the conventional exclusive proprietary rights converted to inclusive proprietary rights. In this context, Dusollier[26] specifically identified two key indicators of inclusivity or inclusive rights, which are:

- the absence of a power to exclude others, which leads to the inclusion of others; and
- the collectiveness of uses, as opposed to the individuality of exclusive rights.

Because this form of proprietary right is devoid of exclusivity, the use of the intellectual resource is not subject to the right owner's or holder's permission. In other words, engaging in any traditionally excluded acts without obtaining the right holder's consent would not constitute infringement.[14,26] The inclusive intellectual property right framework automatically provides every user with a 'legal entitlement' to use the intellectual property.[26] It thereby establishes a sort of 'open' defence protecting users against infringement charges.[14]

It is worth noting that Takenaka[14] offers a slightly different perspective on the notion of inclusive property rights, arguing that inclusive right owners may 'enforce the right defensively' to exclude other rights holders who enforce their own intellectual property rights against them. The author advocates for inclusive rights with limited exclusivity from more of a business point of view than a public interest perspective advocated in this paper. Under the inclusive rights regime proposed, it is emphasised that an inclusive patent could be used by the owner defensively for infringement counterclaims or as bargaining chips if they are sued for using the invention of another intellectual property owner. While this may guarantee access to other protected inventions for an inclusive right owner, it does not promote access for non-owners.

Van Overwalle[27] further proposes two possible modes of institutionalising the inclusive regime. One way is through a 'hybrid, public-private constructed, semi-codified regime', where the inclusive right is provided by law, with no explicit obligation for users or follow-on innovators to share the relevant invention, work or improvements with others. Here, the law would again be complemented with copyleft-type licences to sustain access to improvements. Through the copyleft licence, the right holder, in exercising the one-sided 'right to include' others, is allowed to establish, control and enforce licensing conditions that would require users/follow-on innovators to share in order to 'establish sustainable access and provide a perpetual chain of openness'.[27] By this approach, the right holder can bring legal action against non-willing users/follow-on innovators to end their legal entitlement to use the invention or work and to invalidate the licence. Alternatively, a 'fully-codified' inclusive regime may be adopted. In this case, the (patent or copyright) law establishes 'sustainable access and provides a perpetual chain of openness' by imposing sharing and open access to the relevant invention or work and all improvements or derivatives.[27] This suggests that the improvements or derivatives of such patents or copyrights under the inclusive regime can still be patented, copyrighted or protected under the relevant intellectual property law, but the rights in such improvements or derivatives cannot be exclusion-based owing to the copyleft or grant-back mechanisms embedded in the inclusive rights regime.

Arguably, a fully codified inclusive regime can provide greater legal certainty within an open science system, particularly in the context of health research and innovation.[27] However, as discussed in the previous section, the copyleft concept may not be suitable for all situations, as it is with the non-copyleft concept. Thus, rather than adopting a restrictive, fully codified regime with no options for innovators, creators and other open science actors, this article suggests a comprehensive 'fully codified' inclusive regime that integrates both the copyleft and non-copyleft concepts, ensuring that all persons enjoy inclusive rights in the invention or work while permitting creators and innovators to decide for themselves whether to subject their works and inventions to copylefted or non-copylefted regime.

Of significance is the enforceability of inclusive rights. The proposed regime allows enforceability of users' rights or freedoms, particularly to prevent any claims of exclusive ownership that might hinder their collective entitlement to use a subject matter of inclusive right.[11] In contrast to the limitations of enforcing open licences highlighted earlier, the inclusive regime creates rights *erga omnes* (against the world). While granting the owner a right of inclusion (the right to include others), it equally gives non-owners/users the right to be included (or not to be excluded) – allowing them to use and share the work or invention. Thus, unlike traditional open licences, where enforcement often relies solely on the original right owner, the proposed inclusive rights regime empowers not just the owner but also users or third parties. Essentially, it creates third-party enforcement rights, empowering a broader range of stakeholders to challenge any attempt to restrict access or impose undue limitations on intellectual resources shared for the common good. Indeed, what is a right with no power to enforce? In this context, court decisions affirming inclusive rights to works or inventions in the face of exclusivity claims will automatically confer the benefits upon all.[8,20] This also applies to improvements on works or inventions covered by copyleft-inclusive rights.

Interestingly, Takenake,[14] in addition, proposed a conversion option for rights holders whereby an inclusive property right can be converted to an exclusive property right and vice versa. This resembles the 'licences of right' concept provided for under most patent regimes in Africa, including the Kenyan Industrial Property Act No. 3 of 2001 (section 79), the Nigerian Patents and Designs Act of 1970 (section 10), the South African Patents Act No. 57 of 1978 (section 53) and the Bangui Agreement Instituting an African Intellectual Property Organisation (OAPI) Act of December 14, 2015 (Annex I. Article 42). Under the 'licences of right' regime, patent owners voluntarily give up their rights to exclude others from obtaining licences to exploit the patent. While one can subscribe to the ideals of revising the existing intellectual property regimes to allow for the conversion of existing exclusive property rights to inclusive property rights, it is important to bear in mind that allowing the conversion of inclusive property rights to exclusive property rights challenges the advancement of science as a public good, particularly in relation to open science in the context of health research and development. It would create legal uncertainty concerning the status of the protected invention or work, thereby discouraging the use and further improvement of the invention or work owing to fear of infringement.

With specific regard to patents, it is worth noting that the high costs associated with filing and obtaining patents pose a hurdle to innovators. In this vein, Takenaka[14] and van Overwalle[30] suggest that issuance costs and annual fees for inclusive patents should be discounted. With a lesser patent cost, it is believed that 'all types of innovators can take advantage of the proactive use of inclusive patents'.[14] To further enhance the adoption of an inclusive regime in the patent context, this article aligns with Takenaka's views that inclusive patent rights in inventions be granted without substantive examination.[14] Among others, it is argued that while the substantive examination is to eliminate social welfare costs, such as those associated with patenting trivial improvements that would have

been invented without a grant of exclusive rights, the chances of harming social welfare by issuing inclusive patents without substantive examination is minimal, given that they are not used to exclude others.[14] Takenaka[14] also notes that patent application fees will be substantially reduced as the costs of a search and pre-grant examination are eliminated. Additionally, this could shorten the time often expended between the patent application and the grant.

In Africa, some patent regimes, including the Kenyan Industrial Property Act 2001 (section 44) and the Harare Protocol on Patents and Industrial Designs within the Framework of the African Regional Intellectual Property Organisation (ARIPO) 1982 (section 3(3)), explicitly authorise substantive examinations; others, like the Nigerian Patents and Designs Act 1970 (section 4), only authorised formal examinations. Section 34 of the South African Patents Act 1978 provides for the examination of patents, but it is not explicit as to the form of examination required. At present, the patent office only examines whether the formal requirements have been met.[31] The proposed inclusive patent regime, therefore, calls for amendments to expressly allow for grants of inclusive patents without substantive examination under the regional and national patent systems in the continent.

The important role of inclusive proprietary rights for open science in the context of health research and innovation in Africa

Open licensing currently plays a central role in the open science paradigm and holds particular significance for healthcare in low- and middle-income countries, where the existing traditional intellectual property systems have failed to address increasingly pressing health challenges. However, it is not without its challenges and barriers, as reflected in this article. Recognising and proactively addressing these obstacles is crucial for African countries, researchers and other stakeholders aiming to adopt open science principles to promote health research and innovation for the benefit of people on the continent. In this regard, the inclusive intellectual property regime discussed above holds great promise. A key strength of the inclusive intellectual rights regime lies in its potential to address the enforcement gap in open licensing. By granting third parties the *locus standi* to enforce inclusive rights, it effectively prevents the private appropriation of intellectual resources shared for the common good, ensuring the open science core values of equity and fairness, collective benefit, inclusiveness and diversity, among others. It can empower local researchers and institutions on the continent to actively participate in the protection and utilisation of openly shared health-related innovations and works. This can help to mitigate the challenges of resource limitations in Africa and, thereby, foster a more equitable distribution of health research benefits, particularly those that are publicly funded. Significantly, the enforceability of inclusive rights can help ensure that adaptations and improvements to existing health research and technologies remain accessible and affordable for the benefit of the wider African population. Given the cumulative nature of health research and innovation and the high chances of patent thickets arising, these safeguards are particularly important for the advancement of healthcare in Africa, as the freedom of researchers, follow-on innovators and other actors to operate, innovate on or improve and share existing resources are guaranteed. Overall, the inclusive regime can contribute to fostering a robust and sustainable open science ecosystem within which researchers in different African countries can collaborate in health research and innovation, and more easily build upon each other's work, leading to rapid progress in addressing pressing health challenges in the continent.

It is worth noting that the proposed inclusive intellectual property protection regime is an alternative to and is not a replacement for the existing predominantly exclusionary intellectual property legal standards, as it is believed that 'creation and innovation are promoted both by exclusive rights and by commons'.[11,14] This article, in particular, canvasses comprehensive, inclusive proprietary rights that complement the exclusive proprietary rights under the existing intellectual property regimes in Africa for safeguarding the common enjoyment of creations and inventions stemming from open science in the context of Africa's health research and development. In this context, African countries are able to prioritise their specific health research and innovation needs without breaching their international obligations to grant and protect private exclusive intellectual property rights under the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement) 1994 (as Amended by the 2005 Protocol) and other related international treaties. Particularly, this aligns with article 8 of the TRIPS Agreement, which, as affirmed by the Doha Declaration on the TRIPS Agreement and Public Health 2001, allows member countries, including African countries, to take measures to protect public health and 'to promote the public interest in sectors of vital importance to their socio-economic and technological development'.

Conclusion

There is a growing movement towards open science in Africa, which has the potential to greatly benefit health research and innovation, thereby addressing the health needs of the continent. However, there is a need for a comprehensive intellectual property regime responsive to the adoption of open science practices in health research and innovation in Africa. The existing intellectual property regimes emphasise exclusivity and private ownership and, as reflected above, do not consider shared entitlement to using and developing intellectual resources. This raises issues regarding the adoption and sustainability of open science practices in health research and innovation, including the enforceability of the common entitlement. Thus, this paper advances the legal recognition of the notion of inclusive property rights in Africa, particularly regarding health research and innovation in the context of open science.

The *sui generis* inclusive property rights proposed require a review of existing substantive laws on the continent, particularly those concerning patents and copyrights, to take into account the inclusive rights to intellectual creations and inventions stemming from applying open science practices to health research and innovation. This includes introducing provisions that, among other things:

- give creators and innovators the option to obtain inclusive property rights (copylefted/non-copylefted) over their creations and inventions
- explicitly convert exclusive rights to inclusive rights, such as rights to use, distribute, improve, adapt or modify, among others, regarding inventions and creations covered by the inclusive property rights

- enable third-party enforcement of inclusive rights, with a clear statement as to the implication of court judgments recognising inclusive rights against claims of exclusivity for users
- integrate the concept of 'open' defence to explicitly protect users against infringement liabilities.

In addition to legislative reforms at the national level and to a similar extent at the regional level by OAPI and ARIPO, there is a need to develop the legal notion of inclusive property rights at the continental level to boost open collaborative health research and innovation among African states. This can be achieved through continental policy and norm-setting institutions and instruments, such as the African Union and the AfCFTA Protocol on Intellectual Property Rights.

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