Fertile Fringes: Population Growth at Protected-Area Edges

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Edited Transcript – Justin Brashares and George Wittemyer

Justin Brashares:

George and I started this work almost exactly two years ago and this effort to examine demographic responses to protected areas and our stated goal, at that time, was to increase the dialogue; increase communication; and debate between the conservation, biology and development communities. And I know we're not the first to try and push for this and, by no means, will we be the last but I would say in publishing our work this summer, we've sort of started to see that happen as it relates to the places we work and the things, the issues that we care about**.** So that's been very exciting for us**.** There's certainly been discussion and there's also been a lot of debate and we will touch on some of that in our talk today and, basically, in our short presentation, we'll be passing the baton back and forth and, hopefully, that's not too disturbing for folks trying to listen to us.

The research we'll talk about today is very much macro in its focus**.** We'll be talking about patterns across two continents and we recognize, very much, that the type of patterns that we're presenting, the results that we'll show you today, require more fine scale case study analysis in order to really get at some of the mechanisms behind what we're showing**.** So by no means are we suggesting that we've identified things, everything that's happening at these micro scales but the work that we'll present, while macro, really does come from our own years of working at micro scales in parks primarily in sub-Saharan Africa**.** So I'll get into it here**.**

So protected areas are the backbone of biodiversity conservation strategies throughout the developing world or in the places where most of the world's biodiversity occurs today and this is illustrated in this very simple, somewhat dated map of national parks**.** So this is not all protected areas**.** These are just national parks in sub-Saharan Africa and you can kind of get an idea from this**.** The areas in black are national parks**.** The general, the vast number of parks as well as the scale, the amount of acreage or mileage, if you will, that's covered by protected areas and this trend towards park-based conservation is only increasing in recent

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years so if you look at this little inset you probably can't see the axes but the "Y" axis there is number of protected areas. This is globally and then the "X" axis is year. You can see we're looking at almost an exponential rate of increase in the designation of protected areas.

I would guess this group has talked about this phenomenon before. Certainly I have my own thoughts on this working with aid organizations and working with governments in Africa. I'm amazed at the number of times in which, recently, in which creation or the [unintelligible] of protected areas is tied to aid so there's no doubt in my mind that that would be one driver or one impetus pushing the creation of these protected areas but I'm sure there are others as well. This might be a topic for discussion as we move along.

In any case, we're now looking at close to 80,000 protected areas and that is some sort of area protected for nature or ecosystem services, if you will, ecosystem goods across the globe.

Now when you're talking of developing countries the issue of protected areas is often a sensitive one and understandably. Many of the protected areas that we have today in sub-Saharan Africa and in Latin America are carryovers of areas set aside by colonial governments, so to sum the photo of Salu there in the bottom corner is a historical point of reminiscence and for others he's an emblem of colonial rule gone wild. The sort of set aside or the appropriation or, if you will, the misappropriation of vast amounts of land for, in some cases, for the use of colonial governments to extract resources such as ivory or other natural resources and so there's certainly, as most of you will know, a very mixed history here and the process by which parks are created is not -- is a hotly debated one. And for many researchers and for many communities the creation of parks is seen to come at the cost of local communities and for the benefit of international communities or for a centralized government.

Parks today also still have certainly their economic benefits and one of the major benefits that's talked about quite a lot is tourism, ecotourism but certainly hunting or other forms of legal resource extraction are also major sources of revenue for protected areas and this is not only common in the, you know, the big five game countries of sub-Saharan Africa but it's also increasingly common in Latin America where tourism continues to provide or increasingly provides a large source of internationally derived revenue.

But game viewing is not the only source of revenue or value of these protected areas for economies and livelihoods. What we're seeing increasingly, for example, in this area just

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south of the Ruaha National Park in central Tanzania are fishing communities or other communities that rely on water or intact resources such as fisheries or wildlife where these communities are increasingly drawn to protected areas because they often serve as the last bastions of healthy ecosystems and as water issues, as water continues to become a powerfully important area of consideration across the world, but particularly across Africa, these places that still maintain sort of healthy hydrological systems will only gain increasing focus.

So here you have a community that's settled south of a protected area for access to fisheries and then you also have employment in these protected areas where you have staff or guards or other such positions created**.** For example, Mole National Park in Ghana, another area where I work, you also, and many of you know about this, see an increasing number of services or amenities such as schools, clinics, sanitation and other such services that are often placed on the edges of protected areas or in communities around protected areas and, in many cases, it's quite openly stated that the goal of these amenities -- the reason that these international funds are being put into these communities is to sort of increase tolerance for the protected area so to kind of change the balance there, to show that there is a true benefit to being, to enduring a human wildlife conflict and all the other potential costs of living near a protected area.

There should be some trickle down of tourism dollars that also goes into local communities so I started with a sort of grand scale ecotourism and certainly that should benefit local communities as well**.** I mentioned fishing but something that I study quite a lot is bush meat hunting and, you know, the hunting of wildlife for human consumption and livelihoods and, of course, protected areas have become a focus -- have become true refuges for wildlife populations -- for hunt-able wildlife populations in many areas of the world and because of this they are areas that are attractive to hunters.

So I sort of tried to lay out some of the history and some of the negative conceptions or thoughts on protected areas but also some of the potential benefits**.** When George and I were sort of setting out to embark on this research we came up with our own quick list and this actually, part of this list was, you know, came from other internal papers from USAID and other groups but, basically, what we came down to were a series of factors that we thought could attract communities, could attract immigration to protected areas and that would be schools and clinics and other types of services that were put in place through international donor funding or through national donor funding: employment, as I mentioned, enhanced

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ecosystem services so the wood, the wildlife, the water or other types of provisions that could be found in protected areas but were increasingly rare or expensive outside of protected areas. Market access, so what we're seeing increasingly is a form of development around protected areas.

A way to increase tourism is to link protected areas through paved road networks. But, of course, that could also be attractive for individuals who are looking for market access for agricultural goods or other goods and then security. And so it's quite well documented that at times of strife and in some countries within Africa and Latin America communities have turned towards guards or other forms of enforcement in protected areas as a way of sort of shielding themselves from militias or other groups and, of course, that goes both ways, as I'll talk about.

Some of the deterrents, well, certainly there are major land-use restrictions. I talked about using resources in these protected areas but in many of these protected areas it's illegal to use the resources so there's a certain risk associated with that. If you want to clear a large amount of land you're better off moving away from a protected area.

Wildlife conflict is a major issue. I think you're going to, as I noticed on the schedule, a talk about gorillas in Bwindi. I was in Bwindi earlier this week or last week, whenever that was, and, certainly, elephants and gorillas coming in and stealing bananas and maize and sugarcane is a major issue if you're relying on agriculture in those areas. Just as there could be benefits with the security found in parks there are also risks of conflict so your local community is sometimes dealing with park staff or local governments that are of different backgrounds or coming from different areas in the country.

There's concerns about cultural degradation or just the process by which access or exposure to international tourists affects local cultural practices and it certainly increases the cost of living in some of these areas and then sort of in contrast to the market access or road infrastructure attractant. The fact that many parks are placed in very rural areas because those are places where land can be acquired somewhat easily means that living near a protected area, in many cases, suggests that you're quite isolated or remote from urban centers or other places.

So George and I set out to try and test some of these ideas, to try and see if we could come up with, identify the relative costs or benefits of living on the edges of protected areas and one

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of the ways to do that was to look at patterns of human population growth on as small spatial scales as was possible. We sort of went with the premise that understanding changes in patterns of human settlement might give us some indication on the perception of parks as an economic benefit or cost and so George is going to talk about how we went out or how we set out or went about, sorry, actually, testing some of those patterns.

George Wittemyer:

So Justin and I focused our work primarily on IUCN category one and two protected areas and these are those protected areas that limit human activities within their boundaries so, in essence, these are the protected areas at the center of this park and people debate.

We also wanted to ensure that the trends that we were isolating were related to protected area effects rather than some other, you know, well known, well recognized impetus for growth such as urban migration. So we excluded any protected areas that have an urban area on their boundary and also got rid of marine parks in those parts established after the time when we had demographic data available to analyze so newer parks are not included in our analysis. We ended up with 306 protected areas that we looked at in 45 countries across Africa and Latin America.

We decided to focus in on population growth around, directly around the park and we chose a ten kilometer buffer zone, which is in the figure here shown as the beige region around the green parks. This is focusing on Kenya in this particular image. We chose to look at the ten km boundary because we thought that was a relatively good indice of daily travel, distance, a human on foot could perform and also in the literature it's been used as a metric to look at the difference between protected area resources and the condition of those resources relative to areas outside in order to understand the effectiveness of the protected area. So in order to keep in line with that literature we stuck with that spatial resolution.

In order to quantify growth rates we used United Nations demographic data that were spatially at a resolution of about 4.5 square kilometers in both Africa and Latin America. The reason we focus on Latin America and Africa was actually because the database, the demographic data was limited to those two continents. So we originally also hoped to look at Asia but weren't able to find a temporally explicit as well as spatially explicit data set in which to perform this analysis. And the period of time that the data was available was on a decadal temporal resolution from 1960 to 2000.

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Our results, overwhelmingly, showed that population growth around protected areas was greater than background national, rural growth rates. Again, we isolated and we're looking at rural park so we compared the growth rates around those parts to national/rural levels of growth in order to see how the differences going on.

The top histogram here shows the proportional difference between the protected area growth and that of the national/rural average on a park basis. So you can see we had 245 of the 306 parks we looked at that were actually growing faster than the background rates, some drastically so, as you can see.

We also looked at a country-by-country basis, taking the average population growth of the protected area within each country and comparing that to the national/rural average. This can help control for some pseudo-replication statistical issues so it might be a preferred way to do it but, again, the results were quite strong. We had 38 out of the 45 countries showing faster growth rates on their edges so the results were very clear that there did appear to be a much faster growth rate on the protected area boundary relative to rural areas in the same country.

This is showing the results, the same results again, but looking slightly different, differently and looking at actual country by country basis and another schematic here shows you the relative strength difference between the protected area growth and the background/rural rates so red colors means it's growing much faster than rural growth and green means that it's growing slower than rural rates and what you see here is Latin America actually showed stronger results than Africa. They both were significant differences and, on average, across both continents we found that protected areas were growing about 1% per annum faster than background/rural rates, which is quite striking.

The reason that some countries are very red, such as Brazil, is because their background/rural rates during the time of our study were actually negative so even if population or a protected area edge wasn't growing at all, is relatively stable, it would be faster than the background/rural rates so just to keep that in mind when you're looking at these results.

There's been a lot of discussion about people may be moving to these protected areas because some of them are located in areas of rich biodiversity. Ecologically they may be far superior regions for human agricultural use and perhaps this is what's driving the faster growth rate rather than actually the proximity to the protected area. It's an ecological effect that we're

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registering here and so we wanted a control for that and we chose to do that by looking at the same analysis on an eco-regional basis, which are, you know, ecologically similar regions so you're disregarding political boundaries and now looking, based on ecological factors. And again, we found that the boundaries -- or the areas around protected areas were growing faster than similar regions ecologically. So it did not look like this was mediated by the ecosystem fertility or productivity in the system. It was rather, it was the protected-area proximity that was really driving the trend.

This graph just shows you a comparison between the growth rates we isolated from the United Nations data versus satellite imagery of the same area. The pixilated figure, the red shows high relative growth rates and green is low relative growth rates to the background/rural rates and the satellite imagery shows human development. Basically, you can see deforestation around the edge of these parks. The top is a Brazilian park and the bottom is from Zambia and one issue we were concerned about was, which has been talked a lot about in both development communities and academic communities is about displacement of people from within protected areas to their edges, and so we wanted to make sure we weren't just actually picking up the displacement of these people.

The edges are growing much faster. The people have been displaced and put on the boundaries and, therefore, that's what we were registering so we looked at the protected--I'm sorry--we looked at human population growth both within and outside the park and we found that, actually, in the majority of, I think, 85% of our parks growth rates within the park were actually stable or positive during the same study period. So very few parks were showing a decrease in the human populations within the boundaries. So this led us to believe that we were actually not -- our results weren't being impacted strongly by this displacement issue, which has been a very contentious issue for NGO conservation organizations, as well as development agencies.

We wanted to focus in on the mechanisms that are driving these demographic changes on the boundaries of protected areas. And now, reflecting on some of the things Justin brought up earlier we, again, we're at a very macro scale. It's difficult to throw out a lot of the drivers on a case-by-case basis. The data sets are disparate. A lot of areas it's hard to access information on say, budget or foreign aid or different development projects that have gone on in the area. So we ran into a lot of problems in this side of the project and I think we've done a cursory analysis that gives us some indication of what's going on but by no means does it

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answer a lot of the questions that I think all of us probably have about what's actually driving the changes we see.

But one of the first things we were able to look at was sort of a macro scale country by country funding by the Global Environment Facility and when we looked at the relative differences between protected area growth and background/rural growth relative to these GEF investments we actually found that it was positively correlated. So those countries receiving more money from the GEF tend to have faster growth on the protected area boundaries.

In this graph we separated, for more information, for people that are interested, we separated the countries by continent. So Africa is actually the gray squares and Latin America is the black squares and it shows you that the correlation was really, primarily driven by Latin America, rather than African countries.

Secondly, we wanted to look at a possible other motivator of human immigration towards the protected area boundaries and we chose, you know, employment as a major driver. We figured that would be a major driver of why people might come in order to find occupational opportunities and, again, this turned out to be very difficult. Some areas have very developed tourism industries. Others do not. Getting data on the actual number of, you know, the official or transitory occupation available for people for these different parts is almost impossible and so we're relying on a relatively coarse metric, again, that we hope is a surrogate for general job opportunities for the park and that was the park-based employment. So primarily this is rangers, security rangers, but it also deals with some park staff in the areas and what we found, again, is that there was a positive correlation with growth rates with park employment. And so this indicates that employment may be a benefit that people are seeing or perceiving and that's maybe why they're moving to these areas.

Also a negative correlation on this could be, originally when we set this up we thought this would be a very interesting analysis because a negative correlation could show that the number of guards or protected area staff was decreasing likelihood of people to move there or causing people to move away, as you would expect if harassment or other negative interactions between park employments and the local communities was happening at a wide basis.

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Finally, and probably the one closest to a lot of our hearts in conservation, and certainly Justin's work, is trying to identify what the role of ecosystem service is in driving these population change we registered and, again, this is very difficult. Getting ideas of off take from protected areas, again, is next to impossible. There's some qualitative work on a large scale, a macro scale analysis like ours, it's really difficult to get detailed information that's comparable across all the parks. So we ended up focusing on deforestation rates around parks and this was -- we collected this information from the literature which was established through looking at remote sensing data so it was, again, a sort of broad analysis where the researchers were looking at deforestation rates around different forested parks and a number of those parks happened to be the parks that we looked at. And what we've found among that sample of parks, that areas where we had the fastest growth rates around the protected area boundary also were related to faster deforestation rates and this is deforestation outside the protected areas so, just to clarify.

That was pretty much as far as we could get in the mechanisms and we'll talk a bit more about other things we'd like to look at and open up for discussion with everybody else. I'm sure you have a lot of suggestions on how to really discern what's driving these changes. But for the moment we'll sort of talk about some of the broad policy implications that we figure came out of this work. And to start with, just to rephrase, many if not most of the protected areas that we looked at showed that there was much faster growth rates going around them than there were in background-rural rates and we took this as an indication that there was an attraction going on between local people and protected areas. They're moving there for various reasons.

And with this increased human density and faster population growth a number of risks are occurring or emerging around these protected areas. First of all, the obvious one is the biodiversity conservation objectives are being impacted by higher deforestation rates, off take rates, increasing pressure on the protected area, increased isolation. But also there's a big health risk with emerging infections, diseases and how that relates to human density. A recent work that just came out this year on where EIDs were most prevalent, pinpointed that human density -- higher human density areas were the most at risk and those nearer wildlife populations was a secondary correlate to those. So, basically, what we're looking at is these areas where you're going to have the most interaction with wildlife are having very fast growth rates and getting higher densities. So this will have ramifications for EID and the emergence of infectious disease in the future.

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Justin Brashares:

I'll just talk about a couple of other implications, and I'll just mention one thing about the Global Environment Facility analysis is that those funds that we looked at from the GEF were actually funds that were designated for park-based initiatives. So it's not just a general fund. There's actually funds targeted toward parks so that's why we felt that was a reasonable analysis to look at the impact of development, donor dollars, on park related population growth.

Some of the other implications, and we may be getting a little outside of our results here, but, nevertheless, things that would be important to talk about. You're certainly all aware of the unprecedented rates of urbanization that we're seeing across the globe and much of that is attributed to the perception of opportunities in urban areas that is otherwise unavailable in more rural areas. If protected areas or parks are serving that same role, if they're viewed widely as targets or viewed as fostering opportunities, otherwise absent in rural areas, and if those -- if some of those opportunities or benefits are thought to have come from either national or international donor projects then we, as a donor community, need to think broadly and on broad landscape scales about how we can plan the distribution of those benefits such that we minimize impacts on protected areas. If the goal of the protected area is to protect biodiversity, if we're judging the effectiveness of these areas by their ability to sustain biodiversity for generations, then it only makes sense that when we're placing water treatment, schools, clinics, road networks and other major amenities that we think about the likely impacts of those amenities, those draws to human populations for the protected areas.

Now, certainly, many people will say, "Well, we already do ecological and environmental impact assessments and other things," and I think what George and I would say is that the considerations we're talking about means that those assessments need to be higher up on the priority list. There are examples -- as there are always examples -- but of some of these amenities being placed in known wildlife corridors between protected areas or, as we've all read about, major road projects and other things coming through environmentally fragile areas so, really, what we're talking about here is not cutting off communities from support that they're already receiving, but just the general approach similar to what an urban planner might do, but a general broad approach which says, "Let's think about how we can change the spatial distribution of benefits for local communities."

George Wittemyer:

And to add something to that, I know some of the talks that have gone on in this group and the next one in November talks about some of the refugee movements or the reestablishment of refugee communities such as -- I think you guys had a talk on some of the Kenya refugee situation and how they're going to be put back into a location where they can continue their lifestyles. And we've seen evidence when Rwandan refugee events were occurring some of these refugee camps emerged in areas, much to the chagrin of the local people whose area was adjacent to those refugee camps, and the result of these refugee camps and these resettlement schemes is that they're placed at or near ecologically sensitive areas**.** Those ecologically sensitive areas are degraded rapidly as refugee -- Rwandan refugees is the best case I can think of where there's major deforestation**.** Chimp populations went extinct, et cetera, from where those refugee camps emerged which, of course, is a triage situation so it's not always open for deep thought on where it's going to occur but, again, what we're trying to put forth here is, you know, some -- at some level, at some higher level -- a very quick, even a very quick and coarse look is thought of before a refugee camp is established or a resettlement program is set across the landscape.

Justin Brashares:

Sort of related to the land-use planning idea, multi-use buffers have been in the literature and have been in the planning lexicon for decades**.** I'm sure that general idea being that you'll have different levels of protection, maybe different concentric circles moving outward from a protected area where individuals are able to use a certain outer area for some types of hunting or collecting and then with increasing levels of protection, as one moves toward the core area. And this has been implemented in some places and I haven't seen sort of the, you know, the ultimate analysis of its effectiveness. But generally what we're seeing, what many of us are seeing in our own research is that some of the best sort of protection, if you will, of biodiversity is through isolation**.** You know, basically, isolation or limiting access to individuals on foot is one of the most effective ways to sort of sustain wildlife populations or forest resources or others and so this is sort of, where possible, the idea of reestablishing or creating multi-use buffer zones that make core areas less accessible may be a strategy to continue to allow individuals to benefit from their proximity to nature, their proximity to protected nature, while also sustaining, for the long term, the biodiversity in these protected areas**.** I don't know what we're going to say about this.

This is, for those of you who haven't seen it, this is the paper that we published that came out this summer and it contains a lot of -- as much discussion as one can fit in a three-page paper

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on some of these issues but we also have a large, online, free online appendix that includes a fair amount of other -- because it's sort of meandering and ideas that George and I came up with that couldn't fit into the paper. Do you want to talk about these?

George Wittemyer:

One of the questions we were asked when we were invited to come speak was to bring up any challenges that we've had towards the work, either during the review process or during the subsequent publication and to get to the demography factor, which I'll start with, more technical side. We had a lot of questions about how we define urban versus rural growth and this you can see would have major implications on our results and a couple of people actually performed the same analysis and came out with less strong results and, essentially, they did this by changing how they defined what an urban area was.

So to go over how we did it we actually -- first of all we selected these parks, again, that were rural, calculated their growth rates and then we compared that to official U.N. background-rural growth rates. But there was another way we looked at this as well and that was by excluding urban extent areas using a global urbanization map and we excluded it from the demographic data set from which we calculated these growth rates and then we calculated what we would term rural growth rates from that method and we were a little less hesitant. Actually, the results were less strong but showed the same significant trend that protected areas were growing faster than background-rural rates but the problem with this rate method was that, just to highlight, this is from Rio de Janeiro, actually, the urban extent doesn't cut out all of the high density, high growth areas in an urban setting. And so this was sort of -- the problem is a lot of these global data sets don't perfectly align so they're slightly off, in this case, by a few kilometers. But in that case we're actually including some of the highest density, highest growth regions in our rural metric. So we were concerned about this method although the results, again, supported our -- or sorry -- the analysis again, supported our results.

This is Nairobi. Actually, someone who put in a technical comment to *Science* about this, they chose to use these settlement points, these black dots, and they excluded all the pixels that overlapped with these settlement points and used that to calculate their rural growth rate and so we were using this just to point out that the settlement points do very little justice to what the actual urban extent is in the urban density so I think that's not an appropriate comparison for this analysis. We also had some interpretive challenges.

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Justin Brashares:

Okay, yeah, I can talk about these. One of the challenges was some researchers suggested that communities living near parks really don't receive the benefits that we were describing in our paper. You know, they said, "Well, sure, international donor organizations may be putting hundreds of millions of dollars into park related development every year but very few communities see this," and so I touched on this before but we responded and I think if you read the paper you'll see that we really focused on -- we focused on the idea of perceived benefits. And as I said before regarding urbanization, many of the individuals, probably I dare say most of the individuals who are moving to urban areas are not realizing their dreams of wealth and prosperity in those urban areas and, while we certainly hope more individuals are realizing their goals while moving to protected areas, we certainly would in no way contend nor have we ever contended that individuals are actually acquiring all of these benefits. And considering the plight of many rural agriculturalists it's not hard to believe that, you know, it wouldn't take a great deal of perceived benefits to drive people to sort of pull up shop and move.

We were also challenged on the idea that the GEF alone could give enough money to protected areas to actually drive immigration to those sites. But we just pointed out that we used the GEF as just one indicator. And we've actually -- one of the things George and I have been doing is trying to get EU so EU funding, a detailed EU funding history has just been made available online so we're trying to go back and add that. As we continue to move through this what we think we'll see as we are able to bring together USAID, EU, GEF and maybe even park specific funding information, which the IUCN -- individuals at the IUCN have proposed to help us do, and we'll really get a much clearer, sharper picture on the relationship between donor investment and population growth around protected areas.

George Wittemyer:

Another challenge we got was regarding if what we were actually picking up was growth that was sort of started before the protected area was established or after that because that meant other criteria and this is also a very difficult question to address because a lot of the protected areas that we use were -- have a gazettement date when they became IUCN category one or two, or the most exclusive type of protected area. But many had a history of some sort of protection before as a colonial hunting reserve or some sort of less official status so I think,

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you know, there are a few in there that had, that were probably gazetted as a protected area with no previous standing, but most of them have some history so it's difficult to actually say what was there before the protected area was there and what was after.

The other thing is that we focused on these very rural parks that don't have urban settlements or -- large urban settlements, in this case, was a city over 5,000 people so it actually might be a large village on their boundary so, in that case, we don't think that the protected areas we were looking at were set up in response to pressures from human population change in the beginning and so we thought that wasn't -- we weren't too concerned about that impacting our result.

But one thing that was very interesting and this was brought up actually in the review process for the paper that we thought was a very good point was that our results show faster growth rates but if the communities living around parks are highly impoverished what we all know is the most impoverished communities in the world are growing the fastest so what we might actually be picking up is that the protected areas are having a negative effect to such an extent that they're causing intrinsic growth rates of the community to be much higher than background rates because they're so, they're being so depressed in these communities. And this was something that we did want to look at**.**

We sort of had maintained the whole time that a lot of this was because of immigration, these faster growth rates, and the reason we sort of assumed immigration was some of the growth rates we were picking up were faster than what is possible for even populations to intrinsically grow at so, obviously, in those cases, it had to be immigration that was driving the growth rates**.**

But what we added to the analysis, and this is actually in the paper, is we wanted to take a look at if any indices of poverty were stronger next to protected areas versus areas farther away from protected areas and the indice that we were able to get a global database, again, on in order to perform the analysis was infant mortality, which is strongly correlated with poverty levels. And again, what we found was that there was no statistical differences between areas next to protected areas and those farther away so this by no means shows that intrinsic growth isn't influencing the results we saw but it indicates pretty strongly that it's not a major driver between the difference in protected area edges and other background-rural areas in the same nation.

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Justin Brashares:

We've kind of gone over time, so I'll just generally just say that, as we move forward here, our major effort is to take some of the patterns that we've observed, some of the mechanisms that we're suggesting may be responsible for the patterns that we've observed and look at these at finer scales.

And so we've been, again, we've been delighted by the response from various communities. We have an anthropologist who said, you know, "I was wondering what to do with my Ph.D. I am now heading off to Ecuador and I'm going to these protected areas and I'm going to prove you wrong," which we think is great. You know, prove us wrong but go and collect the data and so and much of what we're doing in each of our groups and together is just to try and look at some of these mechanisms at finer scales and that really does require an interdisciplinary approach and working with folks from agencies and really trying to get access to data sets that may not be so publicly available. I'll just--I was not going to say anything more about that. Is that okay? And we can answer questions if folks want to know more about that.

And I'll just go through this very quickly as well. Again, I just said a second ago, but we had a positive response. Sometimes more of a, you know, a combative in a friendly way, I guess if I can say that, response from individuals at agencies and other groups who wish to follow up on this and this is also very exciting. George and I, whether we like it or not, are somewhat -- or have felt somewhat trapped in the ivory tower but we realize where the work gets done and who actually does the work and how this difference might be made and that's how differences are made and that's another reason why we're excited to be here.

We have had conversations, as I mentioned, with IUCN about their data collection and what they can do to try and comment or inform this decision: preliminary, some discussions with folks at USAID about forming working groups or at the least bringing folks together to talk more about these issues and then individuals at Berkeley in the Bixby Reproductive Health Group are quite interested in looking at that issue of intrinsic growth and health around protected areas so--

George Wittemyer:

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We've also had a number of colleagues write, "What's the big deal? We all know this is happening, so why do you guys get a nice paper out of it?," which is reassuring in a lot of ways.

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