

TRANSCRIPT: OCT 12, 2022 University of Minnesota Medical School Dean's Lecture Series:

**“Building a Scholastic Community That Supports the Advancement of Underserved Students Into the Careers of Medical and Biomedical Research”**

**Presenter: Dr Ben Clarke** Professor, Department of Biological Sciences, University of Minnesota Medical School, Duluth Campus; Director, Bridges to the Baccalaureate Program

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Mya N Wilson DHA: And I will also now turn it over to Vice Dean Núñez to introduce today's speaker. Dr. Núñez -

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Ana Núñez MD: Good morning, thank you, Dr. Wilson. Good morning, everybody - happy October. I hope people here are enjoying our roller coaster weather out there: summer, fall, summer, pre winter. It is Minnesota interesting in terms of how we move through the seasons. I am delighted ... today to introduce Dr. Ben Clarke, Professor (in the) Department of Biological Sciences, University of Minnesota Medical School, Duluth Campus.

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Ana Núñez MD: Dr. Clarke will talk to us and he promises he'll share the secret sauce in terms of an approach for a really important constituency in ... our Minnesota life. Some of our Native American colleagues, and those who really are underserved and have wonderful talent to be able to get there.

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Ana Núñez MD: You know one of the exciting things about coming to Minnesota and meeting all of you is also learning more in terms of our tribal communities. And so with a number of folks, Dr. Owen, Karen Diver, Dr. Clarke, I've had the opportunity to start my learning curve.

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Ana Núñez MD: Recognizing how much more it is that I need to learn but how unique and special and just cool it is that we have such diverse constituencies and communities in Minnesota. And so many of us know the future is about who's coming next, and how we can influence that and Dr. Clarke has been doing that for decades. He started when he was 10 of course but he's been doing that for decades so we are really privileged to hear

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Ana Núñez MD: his insights in terms of how we can ... get some useful tips in terms of doing that. His talk for today is, “Building a scholastic community that supports the advancement of underserved students in the careers of medical and biomedical research.” As I mentioned, Dr. Clarke's a Professor in Biomedical Sciences at Duluth. He obtained his PhD in Biochemistry at UTMB University of Texas Medical Branch in 1986, with post-doctoral training at UT's MD Anderson Tumor Hospital.

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Ana Núñez MD: He then moved to the Department of Biophysics and Physiology at the

University of Alabama as an assistant professor. In 1994 he joined the University of Minnesota's Medical School, Duluth Campus. He's an enrolled member of the Grand Portage band of Ojibwe, and has participated in community and scholarly support for underserved students, with an emphasis on academic opportunities for our Native American students from regional and local communities. He served as a faculty advisor for the Duluth chapter

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Ana Núñez MD: of the American Indian Science and Engineering Society, and as a past member of the Minority Advisory Committee for the American Society of Cell Biology. Currently he serves as the Native American Indigenous Affairs Committee for SACNAS, the Society for Advancement of Chicanos/Hispanics and Native Americans in Science, and since 1988, Dr. Clarke has served on numerous advisory review committees for the National Institute of Health, and in his free time he actually goes to do wonderful water activities

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Ana Núñez MD: in the boundary waters, a place I haven't yet been to but look forward to, and the Quetico wilderness regions and I don't even know where that is but you'll tell me at some other point. Dr. Clarke, thank you so much for joining us, and we look forward to your presentation.

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Dr Benjamin Clarke: Well, thank you for the introduction, Dr. Núñez. And so you know, Quetico is on the northern side of the US Boundary on the other side of the Boundary Waters, a little bit more pristine than the Boundary Waters, but they're both very beautiful.

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Dr Benjamin Clarke: So today I'd like to talk to the group about my experiences with trying to provide academic opportunities for Native Americans, and the things that I've learned since I've been here since 1994.

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Dr Benjamin Clarke: I'm gonna first give a little bit of a talk about the school itself, some about the demographics and the characteristics of the peoples in the Arrowhead region. And then I'm going to talk more specifically about the programs that I've been involved with since 1995.

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Dr Benjamin Clarke: Okay, so just to start off with, this is a wonderful year for Duluth Campus of the University of Minnesota Medical School. This is our fiftieth anniversary and we have a long storied relationship with the Native American community and with rural and underserved populations.

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Dr Benjamin Clarke: We are also in the Duluth area. We are the home of two institutions or agencies that actually reach out to help natives directly: the Center for American, Indian and

Minority Health and then the Memory Keepers. The medical discovery team located here in Duluth. So there are a number of opportunities for native students who want to go on into biomedical research.

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Dr Benjamin Clarke: So to start off with our mission at the Medical School; we were founded in 1972 with a mission to be a leader in educating physicians dedicated to family medicine and to serve the needs of rural Minnesota and Native American communities.

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Dr Benjamin Clarke: And so I want to point out that that wasn't the original mission for the Medical School. It was something that one of the earlier Deans promoted with the faculty and the faculty assumed it and took on. And so this story that I'm gonna talk about today, some of it is me, but one has to remember that

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Dr Benjamin Clarke: it's a community inside of our medical school, and there's been a number of faculty who have contributed many hours and a lot of time and love towards this mission.

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Dr Benjamin Clarke: We do reach out to native communities in Northern Minnesota. And just so you realize each one of these reservations really came from a treaty.

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Dr Benjamin Clarke: There is ceded territory, and virtually each one of the reservations had a separate treaty. The one that's probably most of interest to me in this area is 1854. That's the one that established the reservation that my family comes from; Grand Portage.

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Dr Benjamin Clarke: With these treaties we actually ceded land to the United States in exchange for goods and resources to sustain our peoples.

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Dr Benjamin Clarke: About 150 years ago, around the same time that the University of Minnesota was established, the Morrill Act was passed under the administration of Abraham Lincoln, and the purpose of this moral act was really to improve

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Dr Benjamin Clarke: things for the community use of State resources. And of course there's a gray area between what were State resources and what were indigenous lands. So you know there's a little bit of an issue about

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Dr Benjamin Clarke: how these resources should be shared and brought back to the native people, and for that reason I need to give this land acknowledgment.

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Dr Benjamin Clarke: So I acknowledge that the University of Minnesota, Duluth, is located on the traditional, ancestral, and contemporary lands of indigenous people.

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Dr Benjamin Clarke: The University resides on land that was cared for and called home by the Ojibwe people - before them, the Dakota and Northern Cheyenne people, and other native peoples. From time immemorial this land is ceded by the Ojibwa by the 1854 treaty.

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Dr Benjamin Clarke: This land holds great historical, spiritual, personal significance. For the original stewards, the native nations and peoples of this region. And so the two images I have here are of interest to me, special interest. In the upper right is a landmark, the spiritual place for people on Grand Portage. It's the little cedar spirit tree.

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Dr Benjamin Clarke: This tree is probably in excess of five hundred years of age, and then, as you can see, it's pretty tenacious. It's hanging on this granite outcropping here. It's served as a mile post, a marker for navigation, it's also at the headwaters for the Grand Portage trail,

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Dr Benjamin Clarke: which the voyagers had used to transport furs from the Ontario area. First provided by the Cree, and then traded, and brought by the Ojibwa, and then shipped over

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Dr Benjamin Clarke: to Europe. The other image is really one of the Grand Portage Rendezvous Powwow, to show what the people look like and what they're doing. And so that's of special significance to myself.

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Dr Benjamin Clarke: Now, in Northern Minnesota,

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Dr Benjamin Clarke: The area that I'm interested in: we refer to this as the Arrowhead Region. It's composed of six counties, little over eighteen thousand square miles, and a little over three hundred thousand people, by the US Census from 2000.

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Dr Benjamin Clarke: In this area 3.4% are native, and for the most part, the majority of them reside on four reservations: Bois Forte, Grand Portage, and Fond du Lac

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Dr Benjamin Clarke: and in close proximity there's the Lac Courte Oreilles Mille Lacs, Leech Lake and Red Lake reservations.

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Dr Benjamin Clarke: The region has a lower median income and family income than the rest of the State, and the economy up in this area has historically been dependent on extraction; things like mining and forestry. And now it's transitioning more to tourist type of industries.

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Dr Benjamin Clarke: Within the state just wanted to point out that

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Dr Benjamin Clarke: there is some poverty, significant poverty rates that appear here. We get into Pine County and Aitkin county, the poverty rate for children can get up to around twenty-five percent or more.

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Dr Benjamin Clarke: The average income, the median income, for the State itself is around fifty-seven thousand but people in this region are probably around four to five thousand dollars less on the median income.

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Dr Benjamin Clarke: So there are some economic challenges up here. So what I'd like to talk to you, or address now, is really what the faculty have been doing at the University of Minnesota, Duluth towards improving the scholastic or academic conditions for natives.

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Dr Benjamin Clarke: And I want to break this up into three phases. One is prior to 1990, (then) it's a little short period of '90 to '94, and then '94 and after.

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Dr Benjamin Clarke: Prior to 1990, the Duluth Campus Medical School emphasized these pathways programs. Things for trying to bring students up who are either in grade school, middle school, high school, in college. A large number of these programs were funded extramurally, and I'm showing a few of these up here that I can recall. There's one by NASA, "I Come to Learn," which is for middle schools. There's one that was established

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Dr Benjamin Clarke: back when it was probably the original program stuff at the Medical School. The Ni Shou program, which was a High School apprenticeship for Fond du Lac students and this is funded by the NIH through the Minority Biomedical Research Support, or MBRS.

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Dr Benjamin Clarke: There's been some other programs: Howard Rockefeller for high school students. This one, Indians into Research Careers - I'll elaborate on more in just a minute.

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Dr Benjamin Clarke: Native Americans into Marine Science, which was funded by the Minnesota Sea Grant. So we've offered a number of opportunities for the students over ... time, but these have been

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Dr Benjamin Clarke: workshops that would expose students to faculty or to science concepts, and also to get research experiences.

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Dr Benjamin Clarke: Now, training around 1990 kind of shifted dramatically.

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Dr Benjamin Clarke: The Medical School had gained a lot of experience working with natives, and there was a big push to try and expand resources to develop the physicians training program.

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Dr Benjamin Clarke: And around that time, the faculty pushed for State legislation to get the Center for American Indian and Minority Health established a good portion. This was driven by some faculty at the Medical School, and also a grandmother: Ruth Myers,

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Dr Benjamin Clarke: a Native American woman from Grand Portage, who actually received an honorary PhD in 1994 for all of her efforts with Native American education. And so she and the rest pushed for this establishing for the Center,

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Dr Benjamin Clarke: and the Center has done some rather remarkable things for the school. Since this establishment we've had 158 alumni - natives who have been trained.

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Dr Benjamin Clarke: The program got its initial start by obtaining the Native American Center of Excellence, that really put the school on the map. It was able to bring in a lot of resources to get these programs set up to provide the support, the recruitment and attention that the native fact of male students actually need.

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Dr Benjamin Clarke: The school has established a Native American Research Center for Health with Fond du Lac. This provides some research experiences and some outreach and training

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Dr Benjamin Clarke: for students interested in going into the medical field, and this is actually a very important step. So our Center for American Indian and Minority Health is a true gem.

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Dr Benjamin Clarke: Now they also had some other programs that they've continued beyond the medical school programs which I list down here with Steppingstones, and that Upward Bound Vision Quest that they've been doing. But for the most part the center is focused in on the medical students and promoting medical education.

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Dr Benjamin Clarke: Now, what I would like to talk about now is when I arrived at the University.

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Dr Benjamin Clarke: There was this idea that maybe I could try and take my connections with the community and try to build some training programs.

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Dr Benjamin Clarke: And I actually, through this period from 1994 until now, have experimented with four major programs from the National Institutes of Health.

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Dr Benjamin Clarke: I'll list them here, and I'll talk more about them. There's the "Bridges to the Baccalaureate" program which established as a relationship between the University of Minnesota Duluth and with some local community colleges.

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Dr Benjamin Clarke: There was the "Bridges to the Doctoral" program and this hails back to when our particular campus was independent of the main campus, and we actually had a bridging between the two campuses for students wanting to go up for a PhD. This is called the "Bridges to the Doctoral" program.

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Dr Benjamin Clarke: A little bit after that I applied for a training grant, a T-34 training grant through National Institutes of General Medicine called MARC: Minority Access to Research Careers. And this really brought back this Indians into Research Careers program that we often call IRC. And then finally, I'm going to talk about the "Pathways" program which really was transformational for the training program. So this was really to work with juniors and seniors here at University of Minnesota Duluth.

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Dr Benjamin Clarke: One of the major things you have to remember is trying to recruit natives is a very daunting task. There's a number of things that play into this situation. Within the community, there's barriers from poverty, substandard housing, exposure to violence, the substance abuse, and there's a high rate of suicide - a lot of these bleak type of things that happen when you live in remote rural communities and low income.

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Dr Benjamin Clarke: Drop-out rate from high school on the reservation: It's pretty substantial. Runs around fifty percent. Keep in mind when the students on the reservations usually go and attend a reservation sponsored grade school, possibly middle school - but then they move off the reservation to their high schools, and I suspect that there's a lot of social challenges, a lot of distance involved in trying to travel to the school. It poses a problem there, and the end result is a fairly high dropout rate. The other thing that I found the challenge is that we're a small population.

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Dr Benjamin Clarke: At best, the guess is around two percent of the population. A lot of times when you look at the census data it drops down to maybe about 1.2 to 1.4 percent of the population are considered indigenous or Native American. There's also the issue that there's just not a lot of role models for students to look up to- to follow. And then, because of past historical legacy within the community, boarding schools and trying to change how natives view themselves,

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Dr Benjamin Clarke: there's some resistance within family, and an issue of community support to try and push for this to go for these advanced degrees. I want you to keep in mind when we talk about all of this low number of students and the challenges - when we look at medical schools, only about nine percent of all the medical schools in United States really have more than four native students as medical students and 43% of all these medical schools have no native students.

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Dr Benjamin Clarke: Part of it is because of the just sheer low numbers and the distribution. The other thing that kind of concerns me is that, as of 2016, you know we're looking at (of) roughly 480(thousand) total faculty, in all these medical schools, 141 allopathic schools; 64(%) of that faculty is white, only 0.11% are Native Americans, roughly about 530. So if we try to establish role models for people that are going to be delivering content to the medical students, it'd be nice to have some of them that herald, or come and merge from the population.



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Dr Benjamin Clarke: So that is another challenge. So how to go about increasing native students entering into medicine and research. Again, low numbers - gotta find a way of increasing the visibility of careers. Boost the mentors, the number of mentors and role models. And then the other thing, the best way to get visibility is to develop some community outreach. And so we need to do more to reach out to regional schools and communities. So when we start talking about some of the challenges that the natives face. One of them is education.

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Dr Benjamin Clarke: So if we look at this bar chart on the left. The one that kind of stands out to me the most is if we're looking at just the native students in the Minnesota area. We look at this blue bar. That's the number of people who did not complete their High School diploma and you see roughly, it is roughly about thirty-five(%), and when we go to the natives it's over beyond half of it: 62.8% - that's pretty significant. And what also ... stands out about this is Minnesota prides itself on education, you know, and nationally we're rated second only to Massachusetts as the highest educational attainment - those who've gone on for advanced degrees, and forty-eight percent of the adult population of Minnesota has an associate degree or higher.

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Dr Benjamin Clarke: In the span of 2006 to 2016 whites graduated with a bachelor's degree two and a half times what the Native Americans are coming out with. One in four natives have dropped out of high school ... which is six times greater than whites. Many Native Americans return to obtain a GED: and this is the part that really amazes me, and it kind of reflects a three year lag in the Median ages, for when they enter college. So maybe the challenges that they face in high school cause them to drop out. But when they start facing life's issues of support, and what you want to do through your adulthood, they return to college for training trades for education. But ... they're returning about three years behind, you know, rest of the population.

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Dr Benjamin Clarke: So if we were to take a look at just the demographics around Duluth itself, and we look at Duluth. We look at the major pockets, for where natives would be found. We're ... centrally located to the area, and you could see this heat map here, showing where there is a greater number of minority peoples living up in the very tip of the Minnesota up along the Canadian border - by the way, Dr. Núñez, here's Quetico up here. And then there's these areas in here that we have access to the students, and this is kind of important. Distance does matter, trying to bring students in for school. Taking them over a long distance (that) takes multiple hours to drive to is a significant barrier. So what are the educational characteristics of the peoples in Minnesota, when we think about those who go on to college?

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Dr Benjamin Clarke: So if we take a look at the total number of students that enroll in college between 2006 to 2016, roughly about six hundred and fifty thousand for the State as a whole, and only twelve thousand for natives. We take a look over on this far side. Most of those natives that have returned to school. They're outside of the Twin Cities area. And that's kind of

interesting, since really the largest pocket of native population is really in Minnesota or in Minneapolis. There's roughly about eighteen to twenty thousand that live there. But when you start looking at where they're going school, they're going to these smaller colleges, tribal colleges, community colleges.

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Dr Benjamin Clarke: If you take a look at who had dropped out of high school before they returned to school - roughly about six times as many of the native students dropped out, and if we look at the time when they first enrolled into college, it's roughly that three-year gap that I talked about. So this distance is an issue, and this map shows roughly about one hundred miles or two hundred miles out, three hundred. And when I think about the useful range for where I can interact with students, I'm thinking maybe within this one hundred miles. And even with this range, it had posed some difficulties which I'll bring out when we ... revisit the bridge program.

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Dr Benjamin Clarke: So what I did when I arrived here, I started out with three different programs to see how they could help with Native students. Wanted to provide them with experiences in the lab and get them to meet faculty - actually do some bench work. And I wanted to provide this to underserved and underrepresented people from Northern America or Northern Minnesota. And so the first rounds were of these training programs; for the Bridges to the Baccalaureate, Indians into Research Careers - which was the training program, and Bridges to the Doctorate.

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Dr Benjamin Clarke: So the Bridges to the Baccalaureate. This is the original program that I still have funded, continuously funded, which I'm pretty proud of. It's a research assistantship position - at least it originally was. What we did was, we hired the students to come in and work in the lab, and we actually worked with four different community colleges. There's five; Fond Du Lac Tribal and Community College, which is about twenty four miles away. Lake Superior College, which is within six miles of the campus, and then we reached farther out with Lac Courte Oreilles Ojibwe College in Northern Wisconsin, and then Leech Lake Tribal College. Both of these are on the order of one hundred miles away, and can be a significant travel.

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Dr Benjamin Clarke: The program is still going, but we've dropped it to just two community colleges that were close at hand, and that's Fond du Lac and Lake Superior College. Basically what was happening is this is a two year appointment and students who were coming from these other sites, the Lac Courte Oreilles and Leech Lake. They would only stick around for the first year. The second year it became obvious that the distance was arduous and a challenge. One of the programs I was very proud of, and I was sad to see it go was the Bridges to the Doctorate. So this was a fellowship program that supported students at the Masters level, and we had it from '95 to '00, to pursue a Doctorate Degree. This was funded by the National Institute of General Medical Sciences. It was directed towards Duluth students with the idea or intention that they transition to Minneapolis Doctoral programs.

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Dr Benjamin Clarke: We had some success with this. (Of) a total of ten students, nine of them got masters degrees. One dropped out. Out of that group we had three that went on for Doctorate degrees, and one or two that got medical degrees. And then we have Indians into Research Careers. This is a program that provides fellowship tuition support. The problem with this one (it's for juniors and seniors) - it had a very stringent admissions criteria. (You) had to have 3.5 hours, you had to maintain it, and have a full time course load, and it proved to be a real big challenge for our students. We had a total of eight trainees out of that program, six graduated with a bachelor's degree. Two went on to masters to receive their PhD's. But two dropped out for scholastic reasons.

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Dr Benjamin Clarke: It was pretty tough to maintain that academic course load. So the lessons I learned: cohort size was important. Distance is a major barrier. Something that also came out from interviews is communication skills improve confidence. So if the students could learn to communicate with other people that they weren't actually used to knowing, you know, coming to a big city, faculty, students, staff: becoming comfortable with that. Family and community were very important considerations. The screening criteria for the MARC program was way too stringent. We really needed to shift to a holistic approach rather than GPA scores.

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Dr Benjamin Clarke: Also, we wanted to practice or develop critical reasoning. Have the students ask questions about why, what's, what's the significance? And then just give them the ... confidence of self-belonging. So the reassessment of programs came from this. And so, I was concerned; Native American training is still isolated in the lab. Well, oftentimes, when they enter a lab they're kind of stranded - you know it wasn't unusual to find them over at the dishwashing station. They'd want to feel busy, so they go wash dishes, but they didn't really know how to integrate very well with the rest of the faculty and staff. For Baccalaureate Bridge program, we had a drop out in the first year. A lot of this had to do with distance. There's an intimidation towards learning laboratory procedures at the bench. You know you come in and you're not quite used to maybe the math or the pipettes and these unusual instruments that you have to work with in your first ... to use them.

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Dr Benjamin Clarke: They need some guidance on them. Selection of the MARC program was way too stringent, and we lost a lot of opportunities in the timetable; fifteen hour credit loads per term, maintain a 3.5 average was a challenge. And so the other issue was that this is where gatekeeper courses came up as a big challenge, and I was really interested to see this study that came out last month, and it was published in PNAS Nexus. And basically it was asking a very simple question: What impact do gateway courses have on underrepresented minorities reaching and obtaining a baccalaureate degree in the STEMs field?

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Dr Benjamin Clarke: And so basically what the authors had noted was that women earn about fifty-eight percent of all baccalaureate degrees, but only thirty six percent obtain a STEM degree. Black, and Hispanic, Native American underrepresented minorities are about thirty percent of the population. Thirty-four percent of the incoming STEM undergraduates are from URM but only eighteen percent end up obtaining a stem degree. It's kind of a concern to a lot of agencies: NSF, NIH, and Howard Hughes Medical Institute in particular. We're wondering about these structural barriers, and they're wondering if there isn't an alternative to the, what were considered the current ideas, bridge programs or remedial and

developmental courses or undergrad and research experience, just providing that kind of situation did not necessarily help the students progress.

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Dr Benjamin Clarke: In that co-work that they've looked at the effect of these gateway courses. They went to a unique database grouping. They picked six large R1 institutions from a large database which had a fairly complete listing of ethnicity minority status, what degree that they got, and they tried to find some correlations. I mean, that's one of the first things I had really popped out in this information when I looked at it was just the low number of Native Americans. So even when we went to this larger database that they expanded, it was like one hundred and ten thousand students that they were able to screen from these six universities, and we're still just talking about nine hundred and twenty-two, you know, about less than, probably around .85%

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Dr Benjamin Clarke: So anytime we ever try to judge these things for Natives, we're always going to have an insufficient number, or critical number of students to work with. So what they found was a gatekeeper course with a significant hurdle. ... One of the things that they took a look at was this: a criteria they called getting a grade of D, F, or Withdrawal. And what they found was when they looked at white students - who have one, ... two DFW's, they were more likely to graduate with a STEM degree than a black student who had no DFW's. For academically prepared students passing all introductory STEM classes, forty-eight percent of the white male students will graduate with a STEM degree, and only thirty-five (%) of female students ... are graduating with the STEM degree.

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Dr Benjamin Clarke: So, even though the white students were maybe not performing as well, they were willing to proceed on push for the STEM degree, and so that's kind of an intriguing question to me about why. Why that happens? So that set the groundwork about, How do we get these students to proceed or move beyond these gatekeeper forces, and what I wanted to do is find out a way to get the students to actually identify as a biomedical scientist. You know, if you identify as the scientist, you have a goal, and you're willing to drive some of these challenges. You're willing to try and break the barriers and push beyond.

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Dr Benjamin Clarke: And so (we) wanted to revitalize these programs that we're running. And I show this diagram here. It's got a blue and a green part. On the blue part is something that I think that I could help organize with these programs to give some training: basically a boot camp where we can work with the students from counseling, academic advisement - build their communication skills, introduce (them) to mentors, and first introduction to seminars, teach them how to work in the lab, and impress them about critical thinking and data analysis, and then we move them on to mentors. And then the mentors in the green area. They can develop a research project. And with that research project ... we work with colleagues and data clubs to analyze data, they can practice presenting their ideas. And hopefully, they could move on to

say, "I am a scientist," and they can take this as a show onto the national meeting, give presentations. They can publish results.

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Dr Benjamin Clarke: And hopefully these students will progress on to graduate school. So the demographics of the schools that I'm working with now, (I) work with Lake Superior College, Fond Du Lac Tribal and Community College and University of Minnesota, Duluth.

Approximately ten thousand students in Duluth and smaller groups in Fond du Lac and Lake Superior. The important part about (this) is the number of Native Americans, who have the richest source that we can obtain would be coming from Fond Du Lac to the reservation school. There's also a significant number of natives that come up through the science programs at Lake Superior College. So we're looking at two percent at Lake Superior, and sixteen percent are native at Fond Du Lac.

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Dr Benjamin Clarke: The other interesting part to me is this first time as an undergraduate. So attending UMD, it's doing a start out. It's very common for them to enter UMD as their first college experience, at these community colleges so much lower. These students are repeat students. They've gone somewhere, or they've gone there, and they come back. And so this kind of ties in partly with the lag time to get to the degree. And so what this is telling me is that the students are facing life issues, and they may also need some motivation. Something the idea of what's the end goal? What are they going to get out of this training? These are the kinds of things that we could probably help them with.

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Dr Benjamin Clarke: If we take a look at UMD in particular about the number of students. A good portion of the UMD students (who) are in the College of Science and Engineering, originate from within Minnesota, and we have a fairly good number of native students here. So we have a good pool size, and also with the other, underserved minority groupings. So that we can actually go competitively for these national grants and say "yes we would have enough students to competitively apply for pool". So for instance, if we have a cohort of ten students, the typical rule of thumb is that you need to have at least twenty competitive students for that ten slots. And so if we're going to argue that we want to have five students in a cohort, we need to make sure that we demonstrate that there's at least ten or fifteen that could qualify.

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Dr Benjamin Clarke: And so we did meet that criteria which is very good. So then we establish these programs. But then, what are we going to do while the students are in the program? And so what I wanted to do is develop some sense of professionalism. How they talk, communicate, if they understand what the end goal or the career is, developing the critical reasoning. And a lot of these issues can be taught from faculty to student. But often times it seems to work better if they work communally as a group, and they work together and they share their experiences. And so within the program, what we try to do is build a community within the cohort.

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Dr Benjamin Clarke: We wanted to make sure these students have shared experiences. And we also want to make sure that as often as possible, they had a chance to meet multiple faculty and staff to lower the social barriers so that these native students or even the underserved minority students coming from outside the ivory towers of college can walk in and find out (that) well, (a) good portion of us are just everyday people, you know, and we're approachable. So to get this program going, (we) needed some resources and a very good source at the time was this initiative to maximize student diversity program(s) as offered through the National Institutes of General Medical Sciences. And so basically this is a program that would offer resources for staff or classes. You could pay the students to work in the lab,

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Dr Benjamin Clarke: and so it offered a lot of opportunity for resources that we could provide to these students. And so basically what we did was build the Bridges to the Baccalaureate Pathways program as two parallel programs. Now, remember, I said, I have the Bridges program continuously funded. So this is a program that's working with first and second year community college students, and then in around 2000, we established the Pathways program to work with the students at UMD. And so these two programs they ran two years; year one and year two, and they ran in parallel. We use the same facilities. Same staff. We actually co-mingled the students.

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Dr Benjamin Clarke: And so, at the very beginning of the bridge program, we bring the students in from the community college. We bring the students from Swanson College of Science and Engineering for Boot Camp on campus. Ten week course, they get paid while they're doing them. Then they progress on to work with their faculty mentors in the lab for the academic year. Then they returned the following summer for another ten week experience then finish out and then graduate with the baccalaureate or with the bridge program. The end point was to get an associate's degree, and the endpoint for the pathways program was not only to get baccalaureate degree, but to progress on for a doctoral degree.

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Dr Benjamin Clarke: During the boot camp we had a number of activities that we tried to emphasize one to build academic skills and career planning. This involved an educational psychologist that we had on board - Dr. Phil Slumber. We tried to teach disciplinary research skills, and so this is taught by a number of faculty that were involved. It'd be myself, there was Andy, and then George, Larry Whitmers (were) faculty members who actively participated in these activities, taught ethical behavior and ethics which is a criteria that's required. We also developed programs to develop communication skills. So we have students go through public speaking sessions. They learn how to give lectures, they learn how to sit and do job interviews.

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Dr Benjamin Clarke: We also had debates. So down here we're showing some students standing in front in the back Debate Forum, where they would stand up and defend their ideas. And this is actually kind of an interesting experience for them, because anytime we have alumni that would come back to visit the program, one of the first things that we always ask other people is what was your debate topic? And it seems to leave a lasting memory. Of course, every one of the students they're terrified to get up in front to start the debate, but once they got involved they really enjoyed it, and then they have lots of good memories afterwards - where it's not something that you normally do if you hadn't tried to force them to do it. It was a good experience for them. (in) Critical thinking, we try to employ a lot of active learning. So we

use problem-based learning, some self-directed learning, and we're trying to push things towards developing a concept map, so that you can portray an idea, encapsulate an idea, or a series of ideas

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Dr Benjamin Clarke: in a graphical form, and be able to explain that to somebody. We tried to build a community, particularly with the Bridges program. We had team based research. And then we also had faculty-directed research, ... the traditional research experiences for undergraduates. So when we went back to do a survey of these students after all this is done with: This sliding bar chart shows some of the criteria that we asked, and the one that I really find most appealing is this one. Here is his confidence in my potential to pursue a career in science, and if you see very large gain, this is the criteria that our students gave us the best reading on. We have a number of other types of skills that they develop. But I think this is the one that's going to help or it has proven to show how they can get past this barrier of the gatekeeper courses, and how they have the confidence to progress on.

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Dr Benjamin Clarke: So there's something in this mix about bringing the students together as a community. They feed upon themselves, their own cheerleaders. If you have any kind of a challenge, there's always someone to step in and help. It paid off. So, the outcomes for the program: If we take a look at the Bridge program, we had 51 trainees. 39 completed the program. 43 got associate's degrees, and we actually had six of them that went on to postgraduate programs. In the Pathways program, we had 60 trainees, 49 completed the program, 49 with bachelor's degrees, and 29 that went on to a graduate program. We were getting what I would consider good competitive outcomes. The students were progressing and meeting some of the program objectives. Some of the career progressions that were involved, if we take a look at the number of degrees, the transfer rate from the Bridge program was around 52% - 53% that participated in the Bridge program. If they weren't part of the Bridge program from LSC or Fond Du Lac, only about 20% transferred.

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Dr Benjamin Clarke: Graduation rates for the pathways program was 87% within two years of program completion. And the students' ... productivity, the academic, you know, scholarly productivity: we got 14 publications, peer reviewed publications, 67 national presentations. These are posters, and actually given mini symposia talks at things like ABCRMS or SACNAS. And actually we have one student who attended the ABCRMS meeting won that on the national level - won the toxicology research award. So we're pretty proud of how our students have been performing.

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Dr Benjamin Clarke: So all in all, this is a community to get these programs going. It wasn't something that I drove. It's something that I cajoled, maybe, but I had a lot of help. (The) most

significant help was my partner, Mary Kennedy Clarke. We've been a team, that's my wife. We've been working on these programs since day one. She was the original coordinator before we got the ISD program. A couple of faculty members from the tribal colleges, Mick Gillespie, Andy Wold, and Terrence Wilcox have been invaluable. Pete Willemssen. I didn't talk about this, but we had computer programming coding to help students out ...thinking the rigors, and how to do things sequentially. Pete has been wonderful in teaching them. We just finished this past summer, a course in Python, and which the students really, I was surprised they really loved it. Phyllis Lindberg was the educational psychologist, Amy Prunuske did the course evaluation and she helped on a lot of the curriculum design for me.

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Dr Benjamin Clarke: And as I mentioned Larry Wittmers, and then also Raj Karim out of Biology, and then we just can't forget all the faculty on the campus that helped. I mean just couldn't run these programs without faculty. And also I'd like to thank some people in particular. Ruth Myers, the Grandmother of Education, Minnesota Education. She's the one who helped get the original MBRS program go on and was central to the Center for American Indian and Minority Health. A good colleague, Rick Smith, who was the past director of the American Indian Learning Resource Center. Ciriaco Gonzales, colleague from the NIH who helped educate me on these programs at the very beginning. You can't get started unless someone gives you the guide, you know, tells you, where are you most likely to succeed? And Dr. Gonzales is very informative on that.

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Dr Benjamin Clarke: We also had people from the main campus. Dennis Clayton, who used to be with the graduate school and Josie Johnson, who used to be Vice President of Diversity for the school, couldn't have gotten the doctoral program launched, or the original Bridge program launched without their knowledge, nor without the help of Jack Riggs, who was the President at Fond du Lac at the time, and then last, but on campus at UMD, with Steve Hedman at the graduate school, also got the doctoral program. And yeah, undergraduate programs launched here, and with that I can now take some questions, and I'd like to thank you everybody for listening. I'll turn this back over to you, Dr. Núñez.

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Ana Núñez MD: Thank you so much, Dr. Clarke. We have a couple of questions already, so I'm gonna start with those and hold mine till other folks that have put their stuff in. Dr. Hook with asks when you say cohort size matters, smaller is better for tracking and maintaining relationships, or is larger better for establishing a sense of identity inclusion. Which do you need? Or maybe both right?

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Dr Benjamin Clarke: It's a balance, and I appreciate that question. So in PBL, size matters. They can actively exchange ideas, and they talk, and then it's on a friendly level. You get larger, they hide. You get smaller, you don't really have quite the support structure. But what really helped when we got the IMSD program going in tandem with the Bridge program: We had two years. Each class had between five and ten students. There was at one point we had forty students coming through and so we had eight little cohorts going, and then in eight PBL groups. It was pretty significant when we had the end of the summer research symposia. We had the first floor just crowded with poster board presentations. And so it was quite impressive.

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Dr Benjamin Clarke: So to answer the question, we need to have at least about five for the students to work with. You're never going to do that with native students. There's never going to be enough, and that's why you had to expand into other groups, and I think it was very important to get people to meld and get into this diversity. So if we have two native students, or one native student (in) a group of five, we did really well, and it helped to break some barriers.

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Ana Núñez MD: Great. A second comment from one of our attendees. First, thanking you for an excellent presentation. The question is, Are there things that faculty who aren't directly involved with these programs can do to be more supportive of students who are involved in bridge programs?

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Dr Benjamin Clarke: Yeah, there's a number of things. There was a study that Dr. Pronunci and I did once about the impact of these programs on the mentors and there was some interesting things that kind of fell out with those surveys. One of them was that a lot of the mentors felt like they needed to treat everybody equal. And that sounds right, you know, everybody should be about the same when they come. But we're not. Some of us come from, you know, might be very shy. Some of us might be very outgoing. Some come from big communities, and we're used to the hustle and bustle - the big place, and others are more reticent and quiet, and it's those quiet ones that I worry about, the ones that kind of hide, and that's also the ones that I talked about ended up washing dishes.

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Dr Benjamin Clarke: So sometimes you need to have a little bit more passage, and actually pay more attention to some of these students. It takes some energy also, just to pay attention to them, even if you're not actually mentoring or teaching them, you know. When you see them in a group you try engaging conversation, reassure them, let them know that they're welcome. One of the things about Minnesota Nice though, is that we tend to have benign neglect and with benign neglect, sometimes people feel like they're either ignored or not appreciated. And so that can be a big issue, too. It's just ... general friendliness, helps faculty appreciate having the exposure that was the other part of the mentor evaluation, you know,

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Dr Benjamin Clarke: try and not make everybody treated the same, but identify people who need certain other help. We're faculty, we should be able to identify that and provide it.

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Ana Núñez MD: Great. Thank you. Our next question, Dr. Allen: Very interesting presentation. What are needs opportunities for high school STEM programs? How could they contribute to the success of your undergraduate and graduate programs? And what would be barriers like distance?

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Dr Benjamin Clarke: Well, that's also an interesting one. I have a couple of colleagues that I work with that have reached out to high school and middle school. Dr. Anna Kosebuski or Dr. Widow. She just recently retired. She had a couple of programs going on with Voice Forward and Grand Portage, and now Shannon Redbrook and I are working to try and keep these programs sustained and moving.

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Dr Benjamin Clarke: What you're trying to do is bring some science to the classroom. Have these students learn what an advanced degree in science is and what they can do with it. One of the fears is that they're going to lose their identity as a native student and you gotta just reassure them that you know we're all curious. We want to know about the real natural world, and there's some formalism involved with it and education is a good thing. Doesn't necessarily mean you have to get that PhD and then move to New York. You can move to Minneapolis or Duluth and carry on a job. That's how I look at it!

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Dr Benjamin Clarke: So that's part of it - of exposure to different science projects. So we do a lot with water quality – coliforms, we look at heavy metals in the water, things that intrigue the high school student, things that they can get their hands on. They can pose questions. They can develop hypotheses and learn a little bit about the reductions type of thinking. We try to give them those kinds of experiences.

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Ana Núñez MD: Okay, great. Okay. Miss Porwit asks: First, what are the next steps in improving the number of underrepresented minorities, Native Americans, students entering biomedical science careers. Do you need more programs, more funding, connection with communities outside of Duluth or even further? Secondly, what can we do better in engaging Native American communities in the Twin cities?

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Dr Benjamin Clarke: Very good, all of the above, money always helps, and it's because you need resources in terms of people's time. It takes time to go and interact with everybody, and way back, when we had the original programs, which was just Mary and myself, it was just overwhelming. In many ways my career kind of suffered from that. How much you had to divert and how much things changed when I was able to get more staff involved. When we had the IMDF, and we could hire "near mentors," you know, these are going to be students who made it through the program, came back to work this summer and could help. We had

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Dr Benjamin Clarke: graduate students who came in and do a little bit of work with the students, and we could provide these kinds of resources that helps. So the more money helps. Oh, community outreach is absolutely important. And there's some ideas that have been floating. Dr. Pedro Fernando has this new program that is trying to start up gateway programs where we try to do post baccalaureate training and get some students into masters' programs. But part of it is to get us faculty to go visit these communities, and maybe give a talk like disease of the month,

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Dr Benjamin Clarke: come back and talk about diabetes, talk about cognitive problems, well infectious disease, and almost like a mini medical school. We have to get out there and let the community know what we do as physicians. What we do is biomedical scientists. You know it's kind of behind a dark curtain to a lot of those people.

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Ana Núñez MD: Well, we're at time. Again, thank you so much, Dr. Clarke, for everything that

you've been doing for a really long time and really leading the way about innovations on how we need to do better. Thanks everybody for joining us. Please know there's an evaluation for them. We'd love to hear your ideas and any questions we didn't get, and I'm talking to you, Dr. Dor. Any questions you get, we will get to, instead of answering as Dr. Wilson mentioned, and I hope everybody has a great day.

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Ana Núñez MD: Take care, bye, bye,

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Dr Benjamin Clarke: Thank you.