



*Improving Health in Botswana and Beyond  
Through the Power of Partnership*

# BUP STRATEGIC PLAN

*2022 through 2027*

## ABSTRACT

A road map of BUP's mission and goals for the next 5 years, with a focus on constructive strategy, functional sustainability, and healthy, reciprocal partnerships.

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# STRATEGIC PLAN FOR THE BOTSWANA - UNIVERSITY OF PENNSYLVANIA PARTNERSHIP: 2022 – 2027

## EXECUTIVE SUMMARY

### 1. About the Botswana - University of Pennsylvania Partnership BUP over the Past 20 Years

Since 2001, the Botswana - University of Pennsylvania Partnership (BUP) has been supporting the training and mentoring of talented and driven clinicians, public health experts, educators, and investigators from Botswana. To pursue its mission, in association with the University of Botswana (UB) and the Botswana Ministry of Health and Wellness (MOHW), BUP has leveraged the resources and expertise available at the Perelman School of Medicine (PSOM), the Children's Hospital of Philadelphia (CHOP), and other institutions affiliated with the University of Pennsylvania (Penn). In return, PSOM and CHOP have benefited from BUP, which has been providing a platform for their faculty and trainees to engage in global health.

In the past 20 years, BUP secured approximately \$32,000,000 from the U.S. President's Emergency Plan for AIDS Relief (PEPFAR), the Centers for Diseases Control and Prevention (CDC), numerous awards from the National Institute of Health (NIH), and other federal and private research funds. Almost 200 articles were published in peer-reviewed journals and co-authored by Penn/CHOP and Botswana investigators. Thousands of Penn/CHOP and Botswana students were trained across a broad range of medical specialties and sub-specialties, both in Botswana and at Penn. Lastly, tens of thousands of patients were cared for across a multitude of public hospitals and clinics in every district of Botswana, most notably Princess Marina Hospital (PMH) in Gaborone.

### BUP in the Present

As of July 2022, BUP's team is currently comprised of approximately five full-time Botswana-based faculty and 70 clinical, research, and administrative personnel. Additionally, prior to the COVID-19 pandemic, approximately 80 trainees and 40 faculty from Penn/CHOP used to visit BUP every year. BUP is now finally returning to a pre-COVID-19 baseline.

Initially, BUP's focus was on prevention and treatment of HIV and tuberculosis but it has since greatly expanded in scope to include areas as diverse as dermatology, internal medicine, infectious diseases, laboratory science, mental health and addiction medicine, oncology, pathology, pediatrics, radiology, rural health and community health, surgery, and trauma and

rehabilitation. In all these areas, BUP conducts a combination of training, research, and health service delivery activities.

## 2. Vision for BUP's Next 20 Years

### The Evolving Landscape in Global Health and In Botswana

Despite these achievements, significant health challenges remain both in Botswana and more broadly. Global health as a field is undergoing a major transition in order to achieve universal health coverage (as well as the other health targets within the Sustainable Development Goals (SDGs)), improve preparedness for future pandemics, and address the negative impact of global warming and environmental degradation on health. Botswana is also undergoing a major transition as the country seeks to reach high-income status by 2036, serve as a health care hub for Sub-Saharan Africa, and further expand access to high quality and comprehensive health services to its rural and underserved populations. BUP's strategic plan provides a five-year roadmap to define the partnership's goals and approaches to these challenges and offer a replicable and sustainable model of engagement in Botswana (and, more broadly, in global health) going forward.

### The Need for Transformational Partnerships and BUP's Theory of Change

For every activity conducted or project implemented in Botswana, BUP is committed to pursuing primarily transformational partnerships. Rather than focusing on organizational benefits, transformational partnerships focus on the greater societal good and often require all participating organizations to change practices in profound ways.

BUP sees partnerships not only as a platform to implement projects that advance health, but also as a catalyst for organizational capacity strengthening and transformation. The organizations in need of capacity strengthening are the MOHW and UB as well as Penn/CHOP. The MOHW and UB need to sustain the projects initiated with support from Penn/CHOP and scale these projects in other parts of the country. Simultaneously, Penn and CHOP need to enhance support of their faculty and trainees interested in careers or skill-building in global health.

## 3. BUP's Strategic Plan

### BUP's Strategic Goals

- Improve Access, Coverage, Quality, and Safety of Health Services Delivery and Ultimately Improve Health Outcomes in Botswana
- Strengthen Capacity in Botswana to Sustain/Scale Programs/Projects
- Strengthen Capacity at Penn to Sustain/Scale Programs/Projects
- Generate and Disseminate New Knowledge in Bio-Medical Research, Health Service Delivery, Capacity Strengthening, and Effectiveness/Quality of Partnerships
- Improve the Effectiveness/Quality of the Partnership

These goals are interconnected and mutually reinforcing. One goal cannot be achieved without achieving the others.

## BUP’s Strategic Planning Process and Strategic Plan

BUP’s strategic plan will unfold over a five-year timeline (2022 to 2027). Working groups for each area of engagement identified a set of objectives and activities for each strategic goal. Each working group included Penn/CHOP faculty, trainees, BUP personnel, and their counterparts from the main partners in Botswana (especially the MOHW and UB).

The objectives and activities in Year 1-3 are more detailed and usually linked to current projects and available funding. The objectives and activities in Year 4-5 are aspirational and dependent the availability of additional funding going forward. Each year in the strategic plan corresponds with a fiscal/academic year in the U.S.: (a) **Year 1 (July 2022 – June 2023)**; (b) **Year 2 (July 2023 – June 2024)**; (c) **Year 3 (July 2024 – June 2025)**; (d) **Year 4 (July 2025 – June 2026)**; (e) **Year 5 (July 2026 – June 2027)**.

At the end of every academic year, each working group will be asked to report progress on the objectives and activities for the year that just ended, revise (as needed) the objectives and activities for the following years.

The pursuit of these goals will incentivize BUP to further enact the organization’s mission statement, guiding principles, and theory of change. It will also help strengthen synergies among projects and encourage longitudinal and long-term thinking. Every Penn/CHOP and UB faculty or trainee who works in Botswana through BUP should articulate how and the extent to which their projects and activities are aligned to these goals and the MOHW’s priorities.

## 4. Highlights by Area of Engagement

### General Operations

Goal 5: Strengthen the Partnership	Overarching Objectives/Activities
<i>Strategic Planning and Expansion of BUP Activities and Projects</i>	<ul style="list-style-type: none"> <li>• Track BUP progress on strategic plan and revise objectives/activities as needed</li> <li>• Leverage strategic plan to revise formal agreements with partners in Botswana, fundraise, and disseminate BUP’s achievements</li> <li>• Expand BUP’s areas of engagement across new disciplines, sectors, and geographic areas               <ul style="list-style-type: none"> <li>○ Emergency medicine, primary health care, radiology, veterinary medicine</li> <li>○ Anesthesia, dentistry, surgery</li> <li>○ Obstetrics-gynecology, addiction medicine, other areas of engagement (to be determined)</li> <li>○ Projects in other Sub-Saharan African countries (i.e. Lesotho)</li> </ul> </li> <li>• Scale up fundraising efforts and increase amount of funding from sponsored programs</li> </ul>
<i>Finance and Administration</i>	<ul style="list-style-type: none"> <li>• Strengthen capacity and enhance autonomy of BUP Finance Team for budgeting, spending, invoicing, and accounting</li> <li>• Streamline and standardize processes for grant governance, funding transfers, grant management, and accounting across Penn, CHOP, BUP, and other partners</li> <li>• Strengthen grant submission and management capacity at BUP and keep record of active grants/current funding sources</li> </ul>
<i>Global Health, Logistics, Information Technology, and Human Resources</i>	<ul style="list-style-type: none"> <li>• Continue to support visiting Penn and CHOP faculty and trainees with housing, transportation, orientation, and necessary paperwork</li> <li>• Continue to provide operational support to projects through BUP’s information technology and human resources infrastructure</li> <li>• Continue to build a track record and reputation as an innovative, solution-focused organization that is seen as a standard setter in global health partnerships both in Botswana and beyond</li> </ul>

### Diagnostic and Laboratory Technology

## Dermatology

Goal	Overarching Objectives/Activities
<i>Health Service Delivery</i>	<ul style="list-style-type: none"> <li>Resume provision of clinical care at Princess Marina Hospital (PMH) and outreach clinics, initially through rotating Penn residents and (later) through other U.S./Canadian dermatology residents deployed through the Resident International Grant (RIG). These residents will supplement rather than supersede the contribution of local clinicians and systems</li> <li>Further increase the number and complexity of patients seen at PMH by supporting the hospital dermatologist, possibly leveraging volunteering UB and Botswana private dermatologists, and supporting the Albinism Care Program</li> <li>Further expand access to care in health facilities other than PMH through mobile clinical decision tools available through Visual Dx</li> </ul>
<i>Capacity Strengthening in Botswana</i>	<ul style="list-style-type: none"> <li>Continue to train and mentor Botswana medical students, clinicians, and investigators</li> <li>Enhance access to educational material in dermatology through mobile clinical decision tools available through Visual Dx</li> <li>Assess and possibly support the establishment of telemedicine systems for dermatopathology consultative services</li> </ul>
<i>Capacity Strengthening at Penn</i>	<ul style="list-style-type: none"> <li>Continue the engagement of Penn faculty and trainees</li> </ul>
<i>Knowledge Generation</i>	<ul style="list-style-type: none"> <li>Complete and publish the results of current studies as well as manuscripts in preparation</li> <li>Continue to pursue research projects based on needs/questions identified at point of care, guidance from partners, and funding availability</li> </ul>
<i>Strengthen the Partnership</i>	<ul style="list-style-type: none"> <li>Work closely with the MOHW, UB, and Botswana private dermatologists on: (a) the pursuit of shared objectives, fundraising, and the execution of a sustainability plan to enhance country ownership</li> <li>Engage Botswana dermatologists in the redesign of systems for rotating U.S./Canadian dermatology faculty and residents</li> </ul>

## Laboratory Sciences

Goal	Overarching Objectives/Activities
<i>Capacity Strengthening in Botswana</i>	<ul style="list-style-type: none"> <li>Continue to provide a training and mentoring platform for UB PhD and master students and a research platform for Botswana investigators through the BUP-supported Laboratory Center at UB</li> <li>Seek to expand the scope of research projects supported by the Laboratory Center, fundraise accordingly, and help establish the Laboratory Center as a center of excellence in pharmacogenetics and pharmacogenomics</li> </ul>
<i>Capacity Strengthening at Penn</i>	<ul style="list-style-type: none"> <li>Continue to provide a research platform for Penn and CHOP faculty and trainees and facilitate the link to UB faculty and trainees</li> </ul>
<i>Knowledge Generation</i>	<ul style="list-style-type: none"> <li>Continue to pursue research projects across multiple areas of inquiry (one health, neglected tropical diseases, pharmacogenetics and pharmacogenomics of cancer and infectious diseases, and vector borne diseases)</li> </ul>
<i>Strengthen the Partnership</i>	<ul style="list-style-type: none"> <li>Work closely with UB leadership to gradually transfer programmatic and financial responsibilities for the Laboratory Center to UB</li> </ul>

## Pathology

Goal	Overarching Objectives/Activities
<i>Health Service Delivery</i>	<ul style="list-style-type: none"> <li>Resume and sustain provision of clinical care through rotating Penn faculty and residents</li> </ul>
<i>Capacity Strengthening in Botswana</i>	<ul style="list-style-type: none"> <li>Resume training, mentoring, and supervision of UB Master in Medicine and medical students by Penn faculty and trainees both in person and virtually</li> <li>Support the establishment of telemedicine systems/services in anatomic pathology</li> </ul>
<i>Capacity Strengthening at Penn</i>	<ul style="list-style-type: none"> <li>Resume and sustain the engagement of Penn faculty and trainees</li> </ul>



<b>Knowledge Generation</b>	<ul style="list-style-type: none"> <li>Pursue research projects based on needs/questions identified at point of care, guidance from partners, and funding availability</li> </ul>
<b>Strengthen the Partnership</b>	<ul style="list-style-type: none"> <li>Work closely with the MOHW and UB on the pursuit of shared objectives, fundraising, and the execution of a sustainability plan to enhance country ownership</li> </ul>

## Radiology

Goal	Overarching Objectives/Activities
<b>Health Service Delivery</b>	<ul style="list-style-type: none"> <li>Continue and expand provision of clinical care through rotating Penn and CHOP faculty, clinical fellows, and residents</li> <li>Seek to further expand provision of clinical care through rotating U.S. radiology specialists from academic institutions other than Penn and CHOP</li> </ul>
<b>Capacity Strengthening in Botswana</b>	<ul style="list-style-type: none"> <li>Support the launch of a Master in Medicine (MMed) program in radiology</li> <li>Continue training, mentoring, and supervision of UB MMed and medical students by Penn and CHOP faculty and trainees both in person and virtually</li> <li>Support the establishment of a picture archiving and communication system in Botswana's main teaching hospitals</li> </ul>
<b>Capacity Strengthening at Penn</b>	<ul style="list-style-type: none"> <li>Continue and expand the engagement of Penn and CHOP faculty and trainees</li> </ul>
<b>Knowledge Generation</b>	<ul style="list-style-type: none"> <li>Pursue research projects based on needs/questions identified at point of care, guidance from partners, and funding availability</li> </ul>
<b>Strengthen the Partnership</b>	<ul style="list-style-type: none"> <li>Formalize agreement with U.S. non-profit RAD-AID to deploy additional U.S. radiology specialists to Botswana</li> <li>Work closely with the MOHW and UB on the pursuit of shared objectives, fundraising, and the execution of a sustainability plan to enhance country ownership</li> </ul>

## General Internal Medicine and Other Sub-Specialties

Goal	Overarching Objectives/Activities
<b>Health Service Delivery</b>	<ul style="list-style-type: none"> <li>Continue and expand provision of clinical care for general internal medicine through rotating Penn faculty and residents</li> <li>Expand provision of clinical care across the main subspecialty areas (cardiology, endocrinology, nephrology, neurology, rheumatology, pulmonary critical care, and other subspecialty areas) through rotating Penn faculty and clinical fellows</li> </ul>
<b>Capacity Strengthening in Botswana</b>	<ul style="list-style-type: none"> <li>Continue and expand training, mentoring, and supervision of UB Master in Medicine and medical students by Penn faculty and trainees both in person and virtually</li> <li>Support the curricular revisions at UB across the main subspecialty areas and develop module on leadership and management</li> <li>Support the establishment of certificate programs across the main subspecialty areas targeting practicing clinicians and possibly the establishment of clinical fellowship programs at UB</li> </ul>
<b>Capacity Strengthening at Penn</b>	<ul style="list-style-type: none"> <li>Continue and expand the engagement of Penn faculty and trainees</li> <li>Support the establishment of a global health fellowship in general internal medicine for junior faculty</li> </ul>
<b>Knowledge Generation</b>	<ul style="list-style-type: none"> <li>Pursue research projects based on needs/questions identified at point of care, guidance from partners, and funding availability</li> </ul>
<b>Strengthen the Partnership</b>	<ul style="list-style-type: none"> <li>Work closely with the MOHW and UB (and possibly other U.S. academic institutions with projects in Botswana) on the pursuit of shared objectives, fundraising, and the execution of a sustainability plan to enhance country ownership</li> </ul>

## Infectious Diseases

Goal	Overarching Objectives/Activities
<b>Health Service Delivery</b>	<ul style="list-style-type: none"> <li>Continue and expand provision of clinical care through rotating Penn and CHOP faculty and clinical fellows</li> </ul>

	<ul style="list-style-type: none"> <li>Continue to leverage the findings from research and quality improvement projects to improve practices for clinical care and public health <ul style="list-style-type: none"> <li><b>IMPALA Study:</b> determine prevalence of colonization with and risk factors for extended spectrum cephalosporin-resistant enterobacterales (ESCrE) and carbapenem-resistant enterobacterales (CRE) in hospital, clinic, and community settings.</li> <li><b>NIMBi Study:</b> reduce incidence/prevalence of sepsis in hospitalized neonates</li> <li><b>Ntemoga Study:</b> improve neurocognitive screening and support in children affected by HIV</li> <li><b>SHARE Program:</b> (a) establish systems for automated culture incubation/identification and antimicrobial sensitivity testing in public sector facilities; (b) develop, implement, and evaluate evidence-based interventions to reduce the risk of colonization and hospital-acquired infections from multi-drug resistant organisms</li> <li><b>Tlotloetso Trial:</b> provide services (mostly telephone-based) for smoking cessation in HIV+ smokers</li> </ul> </li> </ul>
<b>Capacity Strengthening in Botswana</b>	<ul style="list-style-type: none"> <li>Continue training, mentoring, and supervision of UB Master in Medicine and medical students by Penn and CHOP faculty and clinical fellows both in person and virtually</li> <li>Continue to support Batswana investigators and trainees with their research projects (<b>HIV and Nutrition Study, IMPALA Study, NIMBi Study, Ntemoga Study, and SHARE Program</b>)</li> <li>Strengthen laboratory capacity for microbiology testing through procurement of equipment and supplies and training of MOHW staff in public sector facilities (<b>IMPALA Study and SHARE Program</b>)</li> <li>Continue to support the submission of new funding opportunities for enrollment of Batswana investigators in a master of science in clinical epidemiology (MSCE) in HIV from Penn or an epidemiology certificate training (ECT) in HIV from Botswana</li> <li>Support the establishment of a clinical fellowship program in infectious diseases at UB</li> </ul>
<b>Capacity Strengthening at Penn</b>	<ul style="list-style-type: none"> <li>Continue and expand the engagement of Penn and CHOP faculty and trainees</li> </ul>
<b>Knowledge Generation</b>	<ul style="list-style-type: none"> <li>Complete current research and quality improvement projects and disseminate findings <ul style="list-style-type: none"> <li><b>AMS Study:</b> evaluate current antibiotic use and the effect of standardized practices in the pediatric surgical unit</li> <li><b>CFAR Pilot Study:</b> compare the brain structure of HIV-exposed uninfected (HEU) and HIV un-exposed uninfected (HUU) neonates</li> <li><b>IMPALA Study:</b> surveillance of ESCrE and CRE in hospital, clinic, and community settings</li> <li><b>MOSAIC Study:</b> assess and improve current antibiotic stewardship (AS) practices in selected inpatient public sector facilities</li> <li><b>NIMBi Study:</b> assess the incidence/prevalence of colonization with organisms causing sepsis in hospitalized neonates, determine impact of HIV exposure, and implement evidence-based interventions to reduce the risk of colonization and hospital-acquired infections</li> <li><b>Ntemoga Study:</b> compare the neurocognitive function of HEU and HUU children and assess the effectiveness of neurocognitive rehabilitation strategies</li> <li><b>Tlotloetso Trial:</b> compare two different behavioral interventions for smoking cessation in HIV+ smokers</li> </ul> </li> <li>Pursue additional research projects based on needs/questions identified at point of care, guidance from partners, and funding availability</li> </ul>
<b>Strengthen the Partnership</b>	<ul style="list-style-type: none"> <li>Work closely with the MOHW, UB, and other key stakeholders in Botswana on the pursuit of shared objectives, fundraising, and the execution of a sustainability plan to enhance country ownership</li> </ul>

## Clinical and Radiation Oncology

Goal	Overarching Objectives/Activities
<b>Health Service Delivery</b>	<ul style="list-style-type: none"> <li>Strengthen the systems to support cancer patients, help them navigate the health system, and link them to care</li> <li>Provide evidence-concordant clinical care in cancer patients undergoing three-dimensional conformal therapy (CRT) for advanced disease</li> </ul>
<b>Capacity Strengthening in Botswana and at Penn</b>	<ul style="list-style-type: none"> <li>Engage UB and BUP-affiliated faculty and trainees in ongoing research, training, and health service delivery activities related to oncology</li> </ul>
<b>Knowledge Generation</b>	<ul style="list-style-type: none"> <li>Enhance the dissemination of the findings from all current projects to the leadership and oncologists at Princess Marina Hospital (PMH) in Gaborone, the Cancer Advisory Board (CAB), the MOHW leadership, and the UB Faculty of Medicine leadership</li> </ul>

<b>Strengthen the Partnership</b>	<ul style="list-style-type: none"> <li>Work closely with the leadership and oncologists at PMH in Gaborone, the Cancer Advisory Board, the MOHW leadership, and the UB Faculty of Medicine leadership to ensure alignment of ongoing activities and current projects with local priorities and monitor progress towards sustainability</li> </ul>
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## General Pediatrics, Adolescent Medicine, and Other Sub-Specialties

Goal	Overarching Objectives/Activities
<b>Health Service Delivery</b>	<ul style="list-style-type: none"> <li>Continue and expand provision of clinical care for general and subspecialty pediatrics through Botswana-based CHOP faculty and global health fellows and rotating CHOP faculty and residents</li> <li>Expand provision of clinical care across several specialty and subspecialty areas (adolescent medicine, cardiology, infectious diseases, mental health, neonatal care, primary care, and surgery)</li> <li>Support the establishment of a neonatal intensive care unit at Sir Ketumile Masire Teaching Hospital (SKMTH)</li> </ul>
<b>Capacity Strengthening in Botswana</b>	<ul style="list-style-type: none"> <li>Continue training, mentoring, and supervision of UB Master in Medicine and medical students by CHOP faculty and trainees both in person and virtually</li> <li>Advance neonatal nursing skills in Botswana starting with PMH and SKMTH towards the establishment of a master program in neonatal nursing</li> <li>Support the initial establishment of certificate programs across the main pediatric subspecialty areas (adolescent medicine, cardiology, infectious diseases, neurology, etc.) and their later evolution into clinical fellowship programs at UB</li> <li>Enhance the educational experience for UB MMed students and medical students of having CHOP faculty and trainees through curricular revisions and novel training opportunities</li> <li>Continue to support the career development of UB faculty through multiple avenues (training, participation in conferences, access to CHOP pilot grants, etc.)</li> </ul>
<b>Capacity Strengthening at Penn</b>	<ul style="list-style-type: none"> <li>Continue and expand the engagement of CHOP faculty and trainees across several specialty and subspecialty areas</li> <li>Enhance the educational experience for CHOP residents through orientation and curricular revisions</li> <li>Establish and sustain a global health fellowship program for nurses at CHOP to advance neonatal skills in Botswana</li> </ul>
<b>Knowledge Generation</b>	<ul style="list-style-type: none"> <li>Complete ongoing projects and publish/disseminate the results <ul style="list-style-type: none"> <li><b>CFAR Pilot Study:</b> compare the brain structure of HIV-exposed uninfected (HEU) and HIV un-exposed uninfected (HUU) neonates</li> <li><b>HIV and Nutrition Study:</b> assess the nutritional status of adolescents and young adults with perinatally-acquired HIV</li> <li><b>NIMBi Study:</b> assess the incidence/prevalence of colonization with organisms causing sepsis in hospitalized neonates, determine impact of HIV exposure, and implement evidence-based interventions to reduce the risk of colonization and hospital-acquired infections</li> <li><b>Ntemoga Study:</b> compare the neurocognitive function of HEU and HUU children and assess the effectiveness of neurocognitive rehabilitation strategies</li> </ul> </li> <li>Increase the number of research projects across new areas of inquiry (adolescent medicine, antibiotic stewardship, HIV and tuberculosis, neonatal care and resuscitation, rehabilitation, etc.) that are co-led by a CHOP PI and Batswana PI</li> </ul>
<b>Strengthen the Partnership</b>	<ul style="list-style-type: none"> <li>Coordinate with the UB Pediatrics Department leadership to monitor progress of the strategic plan, seek feedback on programmatic matters, and pursue programmatic and financial sustainability on ongoing activities and current projects</li> </ul>

## Research Operations

Goal	Overarching Objectives/Activities
<b>Health Service Delivery</b>	<ul style="list-style-type: none"> <li>Seek to strengthen the link between research findings and improvements in access to/quality of care through: (a) enhanced dissemination of findings to clinicians and public health experts both by presenting at existing fora in Botswana and, where needed, helping create new fora; (b) diversification of research projects to include implementation research; (c) establishment/enhancement of health service delivery platforms where research activities are being conducted</li> </ul>
<b>Capacity Strengthening in Botswana</b>	<ul style="list-style-type: none"> <li>Continue to provide a training and mentoring platform for UB PhD and master students and a research platform for Batswana investigators through the BUP-supported Laboratory Center at UB</li> <li>Continue to mentor UB Master in Medicine students with their research/capstone projects</li> </ul>

	<ul style="list-style-type: none"> <li>Continue to support the enrollment of Botswana investigators in a master of science in epidemiology (MSCE) in HIV from Penn or an epidemiology certificate training (ECT) in HIV from Botswana</li> <li>Support the progression MSCE and ECT graduates towards becoming independent investigators and effective research collaborators, respectively</li> <li>Establishment of the Sedibeng (meaning “Well” or “Fountain” in Setswana) consultative service for Botswana investigators</li> </ul>
<b>Capacity Strengthening at Penn</b>	<ul style="list-style-type: none"> <li>Increase the number of Penn/CHOP investigators working in Botswana including using the Sedibeng consultative service to link new faculty not currently working in Botswana with Botswana trainees focused on work in their areas of expertise</li> </ul>
<b>Knowledge Generation</b>	<ul style="list-style-type: none"> <li>Pursue additional research projects based on needs/questions identified at point of care, guidance from partners, and funding availability</li> </ul>
<b>Strengthen the Partnership</b>	<ul style="list-style-type: none"> <li>Work closely with the main partners in Botswana (such as UB and the Community Advisory Board (CAB)) to pursue research projects and shared objectives aligned to local priorities, fundraise accordingly, and execute a sustainability plan to enhance country ownership</li> </ul>

## Vulnerable Populations and Women’s Health

### Primary Health Care and Rural Health

Goal	Overarching Objectives/Activities
<b>Health Service Delivery</b>	<ul style="list-style-type: none"> <li>Support (under the leadership of the MOHW and in close collaboration with local clinical and public health leaders, local communities, and UB) the implementation, evaluation, and quality improvement of community-based multi-disciplinary and multi-sectoral health interventions in the villages of Matsaudi and Phuduhudu (in the Ngamiland district)</li> <li>Support the adoption and scale up of a community-based primary health care model to other villages and regions in Botswana</li> <li>Support (if funding becomes available) the establishment of state of the art health systems in the Ngamiland district and/or the Okavango district that; (a) deliver high quality and comprehensive primary health care; and (b) address socio-economic and environmental determinants of health</li> </ul>
<b>Capacity Strengthening in Botswana</b>	<ul style="list-style-type: none"> <li>Enhance the number of Botswana primary health care trainees (MMed students in Family and Community Health, PhD students in public health, nursing students, etc.) engaged in BUP-supported interventions and BUP activities</li> <li>Support (if funding becomes available) the establishment of state of the art health systems in the Ngamiland district and/or the Okavango district that provides an ideal platform for training in primary health care and rural health</li> </ul>
<b>Capacity Strengthening at Penn</b>	<ul style="list-style-type: none"> <li>Expand the engagement of Penn and CHOP faculty and trainees (for Penn, to possibly include public health as a discipline as well schools and institutes outside of PSOM, such as Penn nursing and Penn veterinary medicine)</li> </ul>
<b>Knowledge Generation</b>	<ul style="list-style-type: none"> <li>Evaluate the impact of current BUP-supported interventions and disseminate findings</li> <li>Support (if funding becomes available) the establishment of state of the art health systems in the Ngamiland district and/or the Okavango district that provide an ideal platform for research in primary health care and rural health</li> </ul>
<b>Strengthen the Partnership</b>	<ul style="list-style-type: none"> <li>Follow the lead of the MOHW and work closely with local clinical and public health leaders, local communities, and UB to monitor progress of the strategic plan, seek feedback on programmatic matters, fundraise, and pursue programmatic and financial sustainability on ongoing activities and current projects <ul style="list-style-type: none"> <li>Possibly consolidate the agreed upon scope of work in a Memorandum of Understanding</li> </ul> </li> </ul>

## Other Areas

### Trauma and Rehabilitation

Goal	Overarching Objectives/Activities
<b>Health Service Delivery</b>	<ul style="list-style-type: none"> <li>Continue to support health service delivery at the Rehabilitation, Prosthetics, and Robotics Laboratory (RPRL) at Sir Ketumile Masire Teaching Hospital (SKMTH) in Gaborone <ul style="list-style-type: none"> <li>Cognitive laboratory</li> <li>Motor laboratory</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>○ Robotics laboratory</li> <li>• Continue to support health service delivery in the Mahalapye District Hospital (MDH) and possibly expand it to other health facilities</li> <li>• Support the establishment of telemedicine systems/services for rehabilitation</li> <li>• Establish mobile prosthetic fitting services using immediate fit adjustable prosthesis (iFIT prosthesis) for lower limbs, with rural populations as a special target</li> </ul>
<b><i>Capacity Strengthening in Botswana</i></b>	<ul style="list-style-type: none"> <li>• Continue to support RPRL at SKMTH in Gaborone and MDH as well as other health facilities with technical advice, training/recruitment of personnel, and technology procurement/maintenance</li> <li>• Revise curricula and foster inter-professional training in rehabilitation for UB computer science students, UB engineering students, UB medical students, UB social science students, and other trainees as needed</li> <li>• Continue to support the completion by Batswana investigators of a master of science in clinical epidemiology (MSCE) or an epidemiology certificate training (ECT) in trauma</li> <li>• Establish a team of prosthetists and prosthetist extenders who can manage patients with iFIT prosthesis</li> <li>• Work with Batswana engineers at SKMTH and laboratories to manufacture prosthetic components iFIT prosthesis</li> <li>• Work with the MOHW and Batswana insurance companies to establish coverage plans for patients in need of prostheses</li> </ul>
<b><i>Capacity Strengthening at Penn</i></b>	<ul style="list-style-type: none"> <li>• Enhance the engagement of Penn and CHOP faculty and trainees across health disciplines and across sectors (including sectors outside of health such as engineering)</li> </ul>
<b><i>Knowledge Generation</i></b>	<ul style="list-style-type: none"> <li>• Pursue additional research projects based on needs/questions identified at point of care, guidance from partners, and funding availability</li> </ul>
<b><i>Strengthen the Partnership</i></b>	<ul style="list-style-type: none"> <li>• Coordinate with the UB Faculty of Medicine leadership, SKTMH leadership, MDH leadership, and other key stakeholders in Botswana (UB Computer Science Department leadership, UB Faculty of Engineering leadership, etc.) to monitor progress of the strategic plan, seek feedback on programmatic matters, and pursue programmatic and financial sustainability on ongoing activities and current projects</li> </ul>

# STRATEGIC PLAN FOR THE BOTSWANA - UNIVERSITY OF PENNSYLVANIA PARTNERSHIP: 2022 – 2027

## SECTION 1: ABOUT THE BOTSWANA – UNIVERSITY OF PENNSYLVANIA PARTNERSHIP

### 1. Mission Statement

“Improving Health in Botswana and Beyond through the Power of Partnership”

#### Guiding Principles

- **Equity:** prioritization of needs of partners (including patients, households, and communities) with greatest vulnerability and lowest level of agency, resources, expertise
- **Accountability:** commitment to shared goals, reliability, willingness to change, honesty about one’s concerns, ideas, and needs
- **Empathy:** profound appreciation for each partner’s values, priorities, agency, and vulnerability
- **Data and Evidence:** ongoing evaluation of partnership quality and effectiveness and adoption of corrective measures when necessary

### 2. BUP over the Past 20 Years

Since 2001, the Botswana - University of Pennsylvania Partnership (BUP) has been supporting the training and mentoring of talented and driven clinicians, public health experts, educators, and investigators from Botswana. This support has occurred at the bedside (in Botswana’s and Penn’s main hospitals and clinics), in the classroom (both in person and virtually), at the laboratory bench, and during the design and implementation of research and health service delivery projects. To pursue its mission, in association with the University of Botswana (UB) and the Botswana Ministry of Health and Wellness (MOHW), BUP has leveraged the resources and expertise available at the Perelman School of Medicine (PSOM), the Children’s Hospital of Philadelphia (CHOP), and other institutions affiliated with the University of Pennsylvania (Penn). In return, PSOM and CHOP have benefited from BUP by providing a platform to engage in global health to their faculty and trainees. The highlights of the past 20 years include many activities and milestones (Table 1).

Table 1. Highlights of the Past 20 Years at BUP\*

**Governance and Collaborations**

- Penn was invited by ACHAP (African Comprehensive AIDS Partnership) the Bill and Melinda Gates Foundation, the Merck Foundation, and the Government of Botswana to support Botswana's response to the HIV pandemic in 2001
- BUP established a formal working relationships through memoranda of agreements with the MOHW and UB in 2004
- Hundreds of partnerships, collaborations, and professional exchanges occurred between Penn/CHOP and Batswana faculty and trainees because of BUP since then

**Programs and Initiatives**

- BUP launched the HIV Care & Support Program in 2003, which scaled up access to high quality and comprehensive preventive and curative health services for tens of thousands of HIV patients
- BUP also launched:
  - A telemedicine program in 2007
  - A national TB program in 2008
  - A cervical cancer screening and treatment program in 2009
  - The Medical Education Partnership Initiative in 2010

**Funding**

- BUP secured approximately \$32,000,000 from the U.S. President's Emergency Plan for AIDS Relief (PEPFAR), the Centers for Diseases Control and Prevention (CDC), numerous awards from the National Institute of Health (NIH), and other federal and private research funds
- BUP secured tens of millions of dollars in donations and endowments from private philanthropy

**Research**

- Approximately 200 articles were published in peer reviewed journals and co-authored by Penn/CHOP and Batswana investigators

**Training**

- BUP partnered with UB to help plan, launch, operate, sustain, and expand Botswana's first medical school with an initial focus on internal medicine, pathology, pediatrics, and radiology
- Thousands of U.S. and Batswana students were trained across a broad range of medical specialties and sub-specialties, both in Botswana and at Penn
- BUP supported undergraduate education, doctorate degrees, master degrees, post-graduate education, and continuing professional development for Batswana students
- Over the past five years, BUP has supported the training and mentoring of four Batswana master students in clinical epidemiology and infectious diseases at Penn and the training of four Batswana master students in trauma and injury at UB
- Prior to the COVID-19 pandemic, Penn would regularly host UB medical students in Philadelphia for clinical observerships and research rotations.

**Health Service Delivery**

- Tens of thousands of patients were cared for across a broad range of medical specialties and subspecialties (especially internal medicine, infectious diseases, oncology, and pediatrics) across a multitude of public hospitals and clinics in every district of Botswana, most notably Princess Marina Hospital (PMH) in Gaborone



\*This list is not comprehensive. For detail, please refer to the individual strategic plans by area of engagement

### 3. BUP in the Present

As of July 2022, BUP’s team is currently comprised of approximately five Botswana-based Penn/CHOP faculty and global health fellows and 70 clinical, research, and administrative personnel (all of whom are from Botswana) (Figure 1). Additionally, approximately 80 trainees (including undergraduates, master and PhD students, residents, and clinical fellows) and 40 faculty (including clinicians, public health experts, educators, and investigators) from Penn and CHOP used to visit BUP every year (prior to the COVID-19 pandemic). BUP is now finally returning to a pre-COVID-19 baseline.

Figure 1. BUP’s Team, Christmas Party, 2019.



BUP conducts a wide range of research, training, and health service delivery activities across many areas of engagement (while also providing operational support to these activities) (Table 2).

Table 2. Current Areas of Engagement for BUP

Area of Engagement	Operational Support	Research	Training	Health Service Delivery
<b>Operations</b>				
General Operations	X			
<b>Diagnostic and Laboratory Technology</b>				
Dermatology		X	X	X
Laboratory Sciences	X	X	X	
Radiology		X	X	X
Pathology			X	X
Telemedicine	X	X	X	
<b>Internal Medicine</b>				
Internal Medicine			X	X
Infectious Diseases	X	X	X	X
Other Subspecialties				
<b>Oncology</b>				
Clinical Oncology		X	X	X
Radiation Oncology		X	X	X
<b>Pediatrics</b>				
General Pediatrics		X	X	X
Adolescent Medicine		X	X	X
Infectious Diseases	X	X	X	X
Other Subspecialties		X	X	X



<b>Research</b>				
Research Operations	X		X	
<b>Vulnerable Populations and Women's Health</b>				
Primary Health Care and Rural Health	X		X	X
Women's Health		X		
<b>Other Areas</b>				
Social Work				
Surgery			X	X
Trauma, Injury, and Rehabilitation	X	X	X	X
Veterinary Medicine		X	X	

Funding for BUP derives from a variety of sources: (a) direct support from PSOM at the University of Pennsylvania; (b) direct support from Penn's health system; (c) direct support from CHOP; (d) research grants for the NIH and the Fogarty International Center (FIC), and other U.S. governmental agencies; (e) implementation grants from the CDC and PEPFAR; (f) other external research grants; (g) other external implementation grants; (h) philanthropy and gifts; and (i) internal grants from PSOM/CHOP (including grants from the Center for AIDS Research (CFAR)) (Table 3).

Table 3. Funding Sources for BUP for the 2020 Fiscal Year

Funding Sources	Amount
Sponsored Programs*	\$2,434,388
Other Income**	\$55,628
Cash Transfers to Programs***	\$1,258,001
Total	\$3,748,017

\*Approximately 55% of CDC/PEPFAR implementation grants, 12% from NIH and FIC grants, 24% from other external grants and gifts, and 7% for internal grants from PSOM and CHOP.

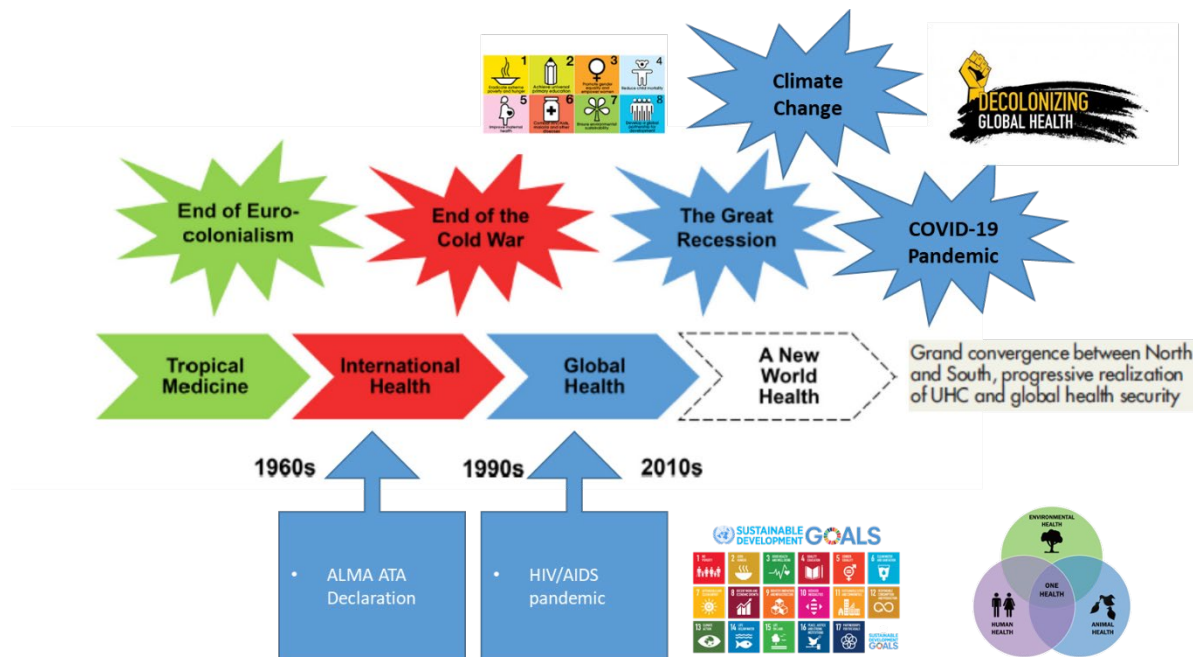
\*\*From rental of BUP facilities to Penn faculty and students.

\*\*\*Approximately 74% from PSOM and 26% from Penn's health system out of a \$ 775,801 total. CHOP supports 50% salary for the BUP Research Director at approximately \$106,000/year (benefits included). CHOP also supports two to three full-time global health pediatric fellows (based full-time in Botswana) at approximately \$95,000/year plus benefits, covers a variable percent salary for fellows who opt to remain in Botswana as they transition to junior faculty, and contributes to administrative expenses for BUP.

## SECTION 2: VISION FOR BUP'S NEXT 20 YEARS

### 1. The Big Picture: The Need for a New World Health

Global health as we know it today was initially born as tropical medicine during the era of colonialism and later evolved into international health during the cold war years (Figure 2) (1, 2).



While the legacy of tropical medicine is closely tied to the legacy of colonialism, the legacy of international health is more complex. These were the years of the Alma Ata declaration (1978), which promoted health as a fundamental human right, and the great vaccination campaigns, which helped eradicate deadly diseases such as smallpox (3). However, these were also the years of development policies that kept funding for global health to a minimum, addressed only a limited set of diseases, and created false dichotomies (such as prevention over care) that stifled global health for the following two decades and that continue to have a negative impact on the field to this day (4).

The past 20 years have witnessed an unprecedented growth in investments in global health (5). The devastating impact of the HIV pandemic and the moral imperative of having to initiate patients on anti-retroviral treatment in Sub-Saharan Africa served as a catalyst for this growth (6). The net result has been the enhanced engagement of a multitude of international and national actors (governments, non-governmental organizations, multilateral institutions, academic institutions, and philanthropy) and the mobilization of considerable resources. New donors (such as the Global Fund for AIDS, Tuberculosis, and Malaria, PEPFAR, and the Bill and Melissa Gates Foundation) increased funding for global health almost five-fold compared to earlier years (7). The launch of the Millennium Development Goals (MDGs) and, later, of the Sustainable Development Goals (SDGs) offered a set of common goals, including targets for health (8, 9).

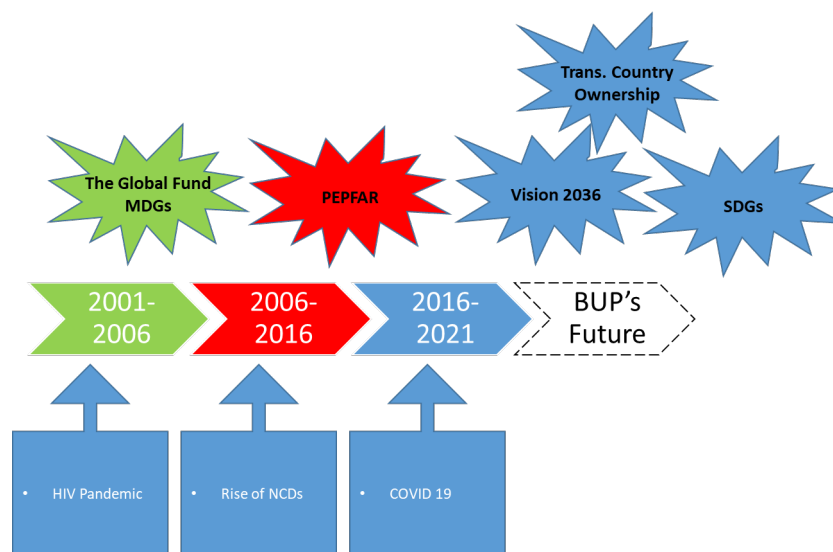
There have been corresponding significant improvements in health outcomes and health equity (10, 11). However, long-standing and deep structural dysfunctions within the global health ecosystem limit the extent to which low-income countries and communities may advance the health of their populations. There are major funding gaps preventing the achievement of the health targets within the third SDG (SDG3 or the “health SDG”) (12). Additionally, the global health eco-system has failed to adequately respond to the current COVID-19 pandemic and the negative impact of climate change and environmental degradation on health (13, 14). New

concepts (such as One Health and decolonization of global health) have emerged in recent years and are now part of the mainstream conversation in global health (15, 16). A new vision for world health is needed to address these complex and multi-faceted challenges (2). How can BUP raise up to these challenges and offer a replicable and sustainable model of engagement in global health going forward?

## 2. The Need for BUP to Adapt to the Evolving Landscape in Botswana

In the beginning, 20 years ago, BUP's efforts focused on prevention and treatment of HIV and tuberculosis because Botswana was in the middle of a devastating epidemic (Figure 3).

**Figure 3. BUP and the Evolving Landscape in Botswana**



Since then, Botswana has made great strides in managing HIV and BUP's focus has expanded to include other diseases (such as non-communicable diseases like diabetes, cancer, and mental health disorders and new types of communicable diseases like hospital acquired infections with multi-drug resistant organisms). These diseases affect both patients with HIV and the general population (17,18). BUP has also played a critical role in supporting UB's effort to establish a new faculty of medicine and launch multiple master in medicine programs across the main subspecialty areas (including internal medicine and pediatrics). Now, Botswana seeks to become a high-income country by 2036 (a goal outlined in the government's "Vision 2036" strategy) and to serve as a health care hub for Sub-Saharan Africa (19). Ensuring that its people live long and healthy lives is a critical component of this strategy.

Despite Botswana's past achievements and ambitious vision for the future, there are persistent health challenges that must be addressed: (a) development assistance for health has decreased and become less consistent, rural and underserved populations (for example in the Kalahari Desert and the Okavango Delta) need greater access to primary health care; (b) the country was deeply impacted by the COVID-19 pandemic, and (c) Botswana remains vulnerable to both climate change and environmental degradation and their negative impact on health (20-23). How can BUP raise up to these challenges and offer a replicable and sustainable model of engagement in Botswana going forward?

### 3. BUP's Strategy: The Need for Transformational Partnerships to Rise Up to the Challenge of the Future

BUP has a very deliberate approach to partnership. Partnerships in global health are important for two reasons: (a) many countries and communities do not yet have all the resources necessary to meet the health needs of their populations; and (b) some challenges are of such scale/complexity and/or span across national and geographic boundaries such that no country and community can tackle them in isolation.

Unfortunately, empirical evidence for the effectiveness of global health partnerships is limited (5). Anecdotally, many partnerships fail to achieve their goals because of inequitable partnership benefits, low trust and accountability and poor evaluation and quality improvement practices. Further evidence is needed to determine whether overcoming these dysfunctions will aid in advancing health globally (24-28).

A recent article published on the British Medical Journal Global Health classifies global health partnerships as transactional, collaborative, and transformational (29). When a partnership is transactional, the primary focus is on organizational benefits and the partner with the most power usually accrues the most benefits (Figure 4). When a partnership is collaborative, the focus is not only on organizational benefits but also on the greater societal good (in the case of global health, continued improvements in health outcomes and reductions in health inequities) while the benefits are distributed more fairly among the partners. Finally, when a partnership is transformational, the focus is primarily on the greater societal good, which requires significant redistribution of power among partners and organizations to change in more fundamental ways than just by tweaking or revising their policies and practices.

For every activity conducted or project implemented in Botswana, BUP is committed to pursuing primarily transformational partnerships.

Figure 4. Transactional, Collaborative, and Transformational Partnerships

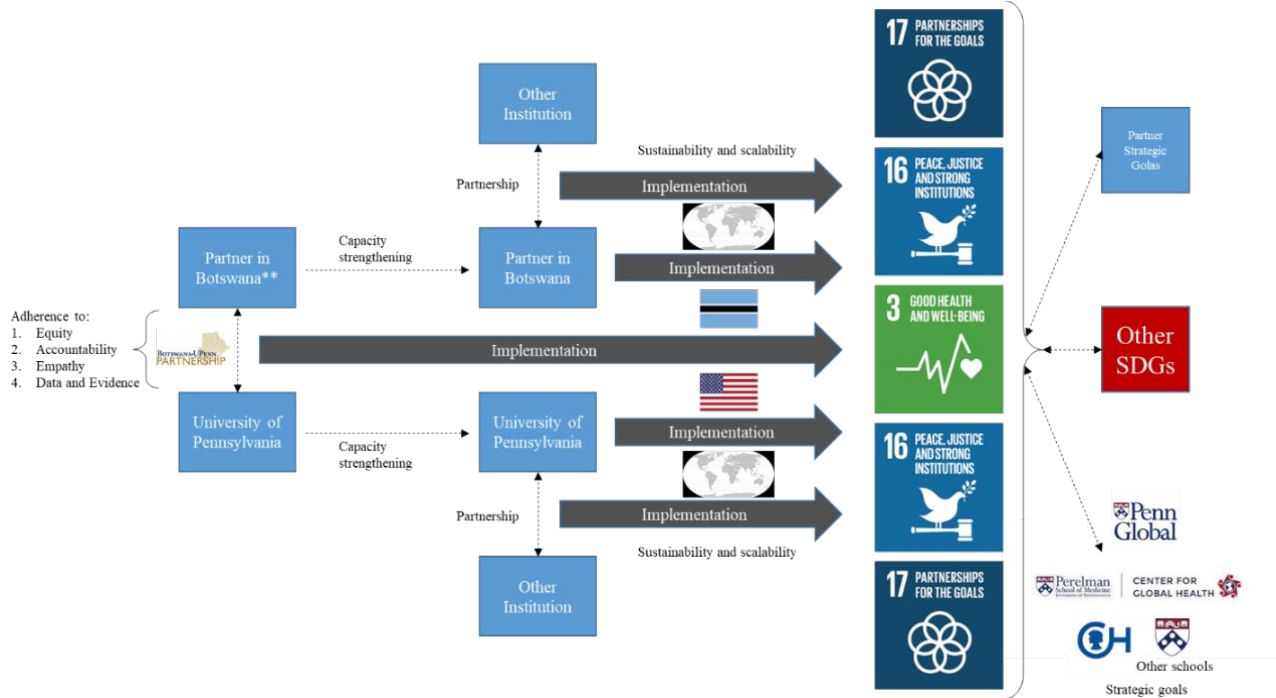


### 4. BUP's Theory of Change

BUP sees partnerships not only as a platform to implement projects that advance health, but also as a catalyst for organizational capacity strengthening and transformation in the pursuit of

sustainable outcomes. As a result, BUP developed a theory of change to inform all of its different projects (Figure 5).

**Figure 5. Partnerships as a Catalyst for Organizational Capacity Strengthening and Transformation**



In this theory, there is an alignment between the activities, objectives, and strategic goals of BUP, those of the partners in Botswana and at Penn/CHOP, and the SDGs (especially (but not only) SDG3, SDG16 (strong institutions), and SDG17 (partnerships for the goals)) (9). As noted above, each of the BUP partners has room to grow in their individual functionality, and in their interconnections and continuity. The MOHW and UB would benefit from additional personnel and stronger systems to sustain the projects initiated through BUP and scale these projects in other parts of the country. Simultaneously, Penn and CHOP need to strengthen their administrative and career development pathways to enhance support of their faculty and trainees interested in careers or skill-building in global health. Additionally, Penn could apply the lessons learned in Botswana to advance the health of marginalized communities in other countries (United States included) (30).

## SECTION 3: BUP'S STRATEGIC PLAN

### 1. BUP's Strategic Goals

BUP has identified five strategic goals, which are the following:

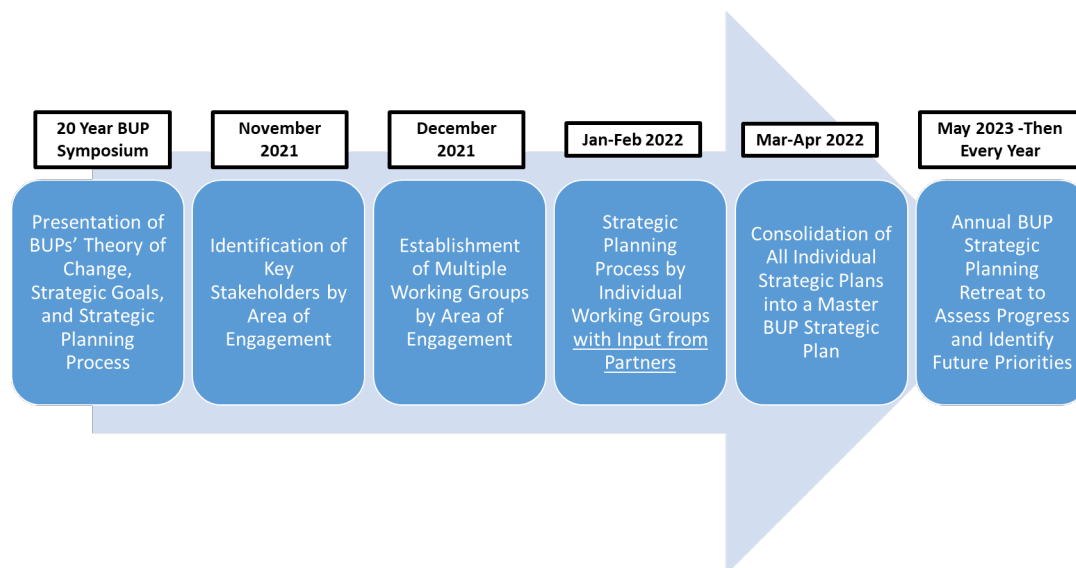
1. **Improve Access, Coverage, Quality, and Safety of Health Services Delivery** and Ultimately Improve Health Outcomes in Botswana.
2. **Strengthen Capacity in Botswana** to Sustain/Scale Programs/Projects.
3. **Strengthen Capacity at Penn** to Sustain/Scale Programs/Projects.
4. **Generate and Disseminate New Knowledge** in Bio-Medical Research, Health Service Delivery, Capacity Strengthening, and Effectiveness/Quality of Partnerships.
5. **Improve the Effectiveness/Quality of the Partnership.**

These goals are interconnected and mutually reinforcing. One goal cannot be achieved without achieving the others. The pursuit of these goals will incentivize BUP to further enact its mission statement, guiding principles, and theory of change. It will also help strengthen synergies among projects and encourage longitudinal and long-term thinking. Every Penn/CHOP and UB faculty and trainee who works in Botswana through BUP will need to articulate how and the extent to which their projects and activities are aligned to these goals and the MOHW's priorities.

### 2. BUP's Strategic Planning Process and Strategic Plan

BUP's strategic plan will unfold over a five-year timeline (2022 to 2027). Working groups for each area of engagement were selected during the symposium to celebrate BUP's 20<sup>th</sup> Year Anniversary in November 2020 (Figure 6).

**Figure 6. Process and Timeline for Development and Revision of BUP Strategic Plan**



Each group included Penn/CHOP faculty, trainees, BUP personnel, and their counterparts from the main partners in Botswana (especially the MOHW and UB). The working groups identified a set of objectives and activities for each strategic goal. The objectives and activities in Year 1-3 are more detailed and usually linked to current projects and available funding. The objectives and activities in Year 4-5 are aspirational and dependent the availability of additional funding

going forward. Each year in the strategic plan corresponds with a fiscal/academic year in the U.S.: (a) **Year 1 (July 2022 – June 2023)**; (b) **Year 2 (July 2023 – June 2024)**; (c) **Year 3 (July 2024 – June 2025)**; (d) **Year 4 (July 2025 – June 2026)**; (e) **Year 5 (July 2026 – June 2027)**.

At the end of every U.S. fiscal/academic year (starting with May 2023), each working group will be asked to report progress on the objectives and activities for the year that just ended, revise (as needed) the objectives and activities for the following two years, and develop objectives and activities for the following years.

Metrics of success for Goal 1 (**Improve Access, Coverage, Quality, and Safety of Health Services Delivery**) include improvements in both access to and quality of care for specific diseases and public health priorities. These improvements can occur because BUP projects can lead to the following results:

- Enhancement in infrastructure, equipment, and supplies in hospitals, clinics, and communities.
- Increase in the number and improvement the competency of health professionals. (physicians, nurses, midwives, mental health specialists, social workers, laboratory technicians, etc.).
- Direct patient care provided by Penn/CHOP faculty and trainees during their rotations in Botswana (and occasionally through virtual consultations).

Metrics of success for Goal 2 (**Strengthen Capacity in Botswana**) include:

- Increase in the number of clinicians, public health experts, educators, and researchers trained in Botswana.
- Improvement in availability and quality of training (for example through new/revised curricula, new online platforms, and enhanced mentoring).
- Strengthening of organizational infrastructure, policies, and processes in Botswana to ensure long-term sustainability for the projects supported by BUP.
- Penn/CHOP faculty and trainees serving as teachers, mentors, and peers to faculty and trainees in Botswana and sharing access to their own resources back in Philadelphia.

Metrics of success for Goal 3 (**Strengthen Capacity at Penn**) include:

- Enhanced engagement of Penn/CHOP faculty and trainees in Botswana.
- Strengthening of organizational infrastructure, policies, and processes to support work overseas and help advance the careers of faculty interested in global health (for example, through the establishment of global health fellowships for junior faculty).
- Bridging the lessons learned in Botswana to inform and advance policies to improve health equity in other countries as well as domestically.

Metrics of success for Goal 4 (**Generate and Disseminate New Knowledge**) include:

- Number/type (or impact factor) of publications by Penn/CHOP and Botswana investigators and the number/type of research projects funded, launched, and implemented in Botswana with support from BUP.
- Diversification of BUP's research projects across multiple areas of inquiry (such as basic bio-medical research, clinical and translational research, monitoring and evaluation and quality improvement, and implementation research).

Metrics of success for Goal 5 (Improve the Effectiveness/Quality of the Partnership) include:

- Development by Penn/CHOP and Botswana partners of joint strategic plans.

- Establishment of platforms and systems to monitor progress and ensure mutual accountability.
- Successful fundraising to support BUP's projects and activities.
- Achievement of programmatic and financial sustainability for the projects supported by BUP.

Goal 5 emphasizes the importance of being very deliberate when establishing strong partnerships. Too often, global health partnerships have been considered primarily as a mean to an end. Instead, BUP considers them an end in of itself and the pre-condition for achieving anything with profound and long-term impact.



## SECTION 4A: HIGHLIGHTS BY AREA OF ENGAGEMENT

### GENERAL OPERATIONS

#### Overarching Objectives and Activities

<b>Goal 5: Strengthen the Partnership</b>	<b>Overarching Objectives/Activities</b>
<i><b>Strategic Planning and Expansion of BUP Activities and Projects</b></i>	<ul style="list-style-type: none"> <li>• Track BUP progress on strategic plan and revise objectives/activities as needed</li> <li>• Leverage strategic plan to revise formal agreements with partners in Botswana, fundraise, and disseminate BUP’s achievements</li> <li>• Expand BUP’s areas of engagement across new disciplines, sectors, and geographic areas               <ul style="list-style-type: none"> <li>○ Emergency medicine, primary health care, radiology, veterinary medicine</li> <li>○ Anesthesia, dentistry, surgery</li> <li>○ Obstetrics-gynecology, addiction medicine, other areas of engagement (to be determined)</li> <li>○ Projects in other Sub-Saharan African countries (i.e. Lesotho)</li> </ul> </li> <li>• Scale up fundraising efforts and increase amount of funding from sponsored programs</li> </ul>
<i><b>Finance and Administration</b></i>	<ul style="list-style-type: none"> <li>• Strengthen capacity and enhance autonomy of BUP Finance Team for budgeting, spending, invoicing, and accounting</li> <li>• Streamline and standardize processes for grant governance, funding transfers, grant management, and accounting across Penn, CHOP, BUP, and other partners</li> <li>• Strengthen grant submission and management capacity at BUP and keep record of active grants/current funding sources</li> </ul>
<i><b>Global Health, Logistics, Information Technology, and Human Resources</b></i>	<ul style="list-style-type: none"> <li>• Continue to support visiting Penn and CHOP faculty and trainees with housing, transportation, orientation, and necessary paperwork</li> <li>• Continue to provide operational support to projects through BUP’s information technology and human resources infrastructure</li> <li>• Continue to build a track record and reputation as an innovative, solution-focused organization that is seen as a standard setter in global health partnerships both in Botswana and beyond</li> </ul>

## Detailed Objectives, Activities, and Timeline

### 1. Strategic Planning and Expansion of BUP Activities and Projects

Year 1 (July 2022 – June 2023):

- BUP’s strategic plan will: (a) guide the revision of BUP’s current memorandum of agreement with the MOHW; (b) be adapted to serve as a fundraising tool; and (c) provide the foundation for a multi-author article on BUP’s past, present, and future.
- The BUP Executive Director will work with CGH/PSOM and the Development Office at PSOM on a fundraising campaign for BUP.

## Years 2-5 (July 2023 – June 2027)

- The BUP Director will coordinate with the working groups and lead the process to assess progress on the previous year's objectives and activities and revise BUP's strategic plan as needed for the following years.
- The BUP Director will continue to facilitate the expansion of BUP's activities across new or under-developed areas of engagement
- Years 1-2 (July 2022 – June 2024): emergency medicine, primary health care, radiology, veterinary medicine
- Years 2-3 (July 2023 – June 2025): anesthesia, dentistry, surgery
- Years 3-4 (July 2024 – June 2026): obstetrics-gynecology, addiction medicine, other areas of engagement (to be determined)
- In partnership with the Foreign Mission Board of the National Baptist Convention (NBC/FMB) and the Government of Lesotho, the BUP Director will continue to pursue the launch (Years 1-2; July 2022 – June 2024) and implementation (Years 3-5; July 2024 – June 2027) of a primary health care project in Lesotho.

## 2. Finance and Administration

### Year 1 (July 2022 – June 2023):

- The BUP Finance Team in Botswana will acquire greater autonomy from the Center for Global Health at PSOM (CGH/PSOM) in: (a) developing BUP's annual budget; (b) approving and tracking expenses; and (c) generating invoices/financial statements.
- The BUP Finance Team will start managing awards that span across multiple Department/Divisions at Penn/CHOP and require a centralized or Botswana-based administration.
- The Business Administrators (BAs) from the Departments/Divisions at Penn/CHOP where BUP-affiliated Principal Investigators (PIs) have their primary appointments will manage all other awards.
- The BUP Finance Team, BUP's Director of Research, and CGH/PSOM will: (a) maintain a database of BUP's funding sources/awards; and (b) revise/administer policies for developing the budgets for funding proposals (to ensure that cost estimates are accurate and that general operations receives adequate financial support).

### Years 2-4 (July 2023 – June 2026):

- The BUP Executive Director and the BUP Finance Team might opt to activate Catalyst for Health Equity (BUP's newly registered twin non-profit organization) to manage awards that require a local organization as the primary recipient. The number of these awards will likely increase over the following five years.

### 3. Global Health, Logistics, Information Technology, and Human Resources

Years 1-5 (July 2022 – June 2027):

- The BUP Global Health and Logistics Team will continue to be in charge of hosting, orienting, processing paperwork for, and facilitating the rotation of Penn/CHOP faculty and trainees as well as other visitors.
- The BUP Information Technology Team will continue: (a) be in charge of the purchase, maintenance, and repair of IT equipment/supplies; and (b) assist BUP personnel and Penn/CHOP faculty and trainees with virtual events and online platforms.
- The BUP Human Resources Team will continue to lead the revision/administration of policies to recruit, compensate, evaluate, promote, and terminate BUP personnel.

## SECTION 4B: HIGHLIGHTS BY AREA OF ENGAGEMENT

### DIAGNOSTIC AND LABORATORY TECHNOLOGY

#### 1. Dermatology

##### Overarching Objectives and Activities

Goal	Overarching Objectives/Activities
<i>Health Service Delivery</i>	<ul style="list-style-type: none"> <li>Resume provision of clinical care at Princess Marina Hospital (PMH) and outreach clinics, initially through rotating Penn residents and (later) through other U.S./Canadian dermatology residents deployed through the Resident International Grant (RIG). These residents will supplement rather than supersede the contribution of local clinicians and systems</li> <li>Further increase the number and complexity of patients seen at PMH by supporting the hospital dermatologist, possibly leveraging volunteering UB Batswana and private dermatologists, and supporting the Albinism Care Program</li> <li>Further expand access to care in health facilities other than PMH through mobile clinical decision tools available through Visual Dx</li> </ul>
<i>Capacity Strengthening in Botswana</i>	<ul style="list-style-type: none"> <li>Continue to train and mentor Batswana medical students, clinicians, and investigators</li> <li>Enhance access to educational material in dermatology through mobile clinical decision tools available through Visual Dx</li> <li>Assess and possibly support the establishment of telemedicine systems for dermatopathology consultative services</li> </ul>
<i>Capacity Strengthening at Penn</i>	<ul style="list-style-type: none"> <li>Continue the engagement of Penn faculty and trainees</li> </ul>
<i>Knowledge Generation</i>	<ul style="list-style-type: none"> <li>Complete and publish the results of current studies as well as manuscripts in preparation</li> <li>Continue to pursue research projects based on needs/questions identified at point of care, guidance from partners, and funding availability</li> </ul>
<i>Strengthen the Partnership</i>	<ul style="list-style-type: none"> <li>Work closely with the MOHW, UB, and Batswana private dermatologists on: (a) the pursuit of shared objectives, fundraising, and the execution of a sustainability plan to enhance country ownership</li> <li>Engage Batswana dermatologists in the redesign of systems for rotating U.S./Canadian dermatology faculty and residents</li> </ul>

##### Detailed Objectives, Activities, and Timeline

###### Health Service Delivery

###### YEAR 1 (JULY 2022 – JUNE 2023):

- One Penn dermatology resident will rotate in Botswana (approximately four weeks per rotation) to provide clinical care in the dermatology clinic at Princess Marina Hospital (PMH) in Gaborone, support the Albinism Care Program, and facilitate the utilization of a mobile clinical decision tool (Visual Dx).
- The Penn dermatology residents will supplement rather than supersede the contribution of local clinicians and systems.

- The Albinism Care Program will continue to be operated by the dermatology clinic at PMH and provide clinical care, sun protective items, psychosocial support, and advocacy to patients with albinism in Botswana.

#### YEAR 2 (JULY 2023 – JUNE 2024):

- The number of BUP-affiliated dermatology residents (approximately half from Penn and half from other U.S./Canadian academic institutions) will increase to six per year. The non-Penn dermatology residents will be deployed to Botswana through the Residents International Grant (RIG), an award funded by the American Academic of Dermatology. Like the Penn residents, these residents will also supplement rather than supersede the contribution of local clinicians and systems.
- The mobile clinical decision tools available through Visual Dx will further expand access to care to health facilities other than PMH.

#### YEARS 2-5 (JULY 2023 – JUNE 2027):

- Botswana dermatologists and primary care providers will be able to participate in dermatology grand rounds at Penn and share complex cases with Penn dermatology faculty and trainees in a virtual format.
- The BUP Dermatology Program will facilitate the establishment of a system that will allow UB and Botswana private dermatologists to volunteer in the dermatology clinic at PMH.

#### Capacity Strengthening in Botswana

##### YEARS 1-3 (JULY 2022 – JUNE 2025):

- The BUP-affiliated dermatology residents will provide training and mentoring at point of care Botswana primary care providers and UB medical students.

##### YEARS 2-3 (JULY 2023 – JUNE 2025):

- The BUP Dermatology Program will work with the PMH leadership, the hospital dermatologists, and the pathologist at the National Health Laboratory (NHL) to re-establish dermatopathology consultative services, including through telemedicine systems.

##### YEARS 4-5 (JULY 2025 – JUNE 2027):

- The BUP Dermatology Program will support a newly recruited UB Dermatology faculty and the faculty's effort to expand educational opportunities for UB medical students and other trainees.
- The BUP Dermatology Program will facilitate the transition of the dermatopathology consultative services to Botswana dermatologists and pathologists.

#### Capacity Strengthening at Penn

##### YEARS 1-5 (JULY 2022 – JUNE 2027):

- Approximately three Penn dermatology residents per year will rotate in Botswana and gain exposure to global health, which might inform future academic endeavors.

YEARS 2-5 (JULY 2023 – JUNE 2027):

- Penn dermatology faculty and trainees will be able to consult on complex cases from Botswana in a virtual format.

Knowledge Generation

YEAR 1 (JULY 2022 – JUNE 2023):

- The BUP Dermatology Program will perform a gap analysis/baseline assessment of current telemedicine systems/services in dermatology and dermatopathology.
- The BUP Dermatology Program will submit three manuscripts for publication on: (a) retrospective analysis of skin cancers; (b) evaluation of Whatsapp as a telemedicine platform; and (c) evaluation of a mobile clinical decision tool (Visual Dx).

YEARS 1-3 (JULY 2022 – JUNE 2025):

- The BUP Dermatology Program will support a research project on albinism led by Dr Bwanali Jarani (a UB PhD student).

YEARS 2-5 (JULY 2023 – JUNE 2027):

- The BUP Dermatology Program will pursue other research projects based on needs/questions identified at point of care, guidance from partners at UB and the MOHW, and funding availability (with the goal of publishing at least one article by 2025).

Strengthen the Partnership

YEAR 1 (JULY 2022 – JUNE 2023):

- The BUP Dermatology Program will coordinate with Batswana private dermatologists to increase coverage for the dermatology clinic at PMH (one extra day per week).
- The BUP Dermatology Program will seek funding to: (a) support the Albinism Care Program at PMH and expand it to other health facilities; (b) expand the utilization of a mobile clinical decision tool (Visual Dx); (c) enroll one primary care nurse at PMH in a dermatology training program; and (d) establish telemedicine systems/services in dermatology and dermatopathology at PMH.

YEARS 1-5 (JULY 2022 – JUNE 2027):

- The BUP Dermatology Program will hold annual meetings with partners at UB and the MOHW, Batswana private dermatologists, and other key stakeholders in Botswana to: (a) assess progress on the previous year’s objectives and activities and revise BUP’s strategic plan as needed for the following years; (b) develop/execute sustainability plans for all current projects and promote country ownership.

## 2. Laboratory Sciences

### Overarching Objectives and Activities

Goal	Overarching Objectives/Activities
<i>Capacity Strengthening in Botswana</i>	<ul style="list-style-type: none"> <li>• Continue to provide a training and mentoring platform for UB PhD and master students and a research platform for Batswana investigators through the BUP-supported Laboratory Center at UB</li> </ul>

	<ul style="list-style-type: none"> <li>Seek to expand the scope of research projects supported by the Laboratory Center, fundraise accordingly, and help establish the Laboratory Center as a center of excellence in pharmacogenetics and pharmacogenomics</li> </ul>
<b><i>Capacity Strengthening at Penn</i></b>	<ul style="list-style-type: none"> <li>Continue to provide a research platform for Penn and CHOP faculty and trainees</li> </ul>
<b><i>Knowledge Generation</i></b>	<ul style="list-style-type: none"> <li>Continue to pursue research projects across multiple areas of inquiry (one health, neglected tropical diseases, pharmacogenetics and pharmacogenomics of cancer and infectious diseases, and vector borne diseases)</li> </ul>
<b><i>Strengthen the Partnership</i></b>	<ul style="list-style-type: none"> <li>Work closely with UB leadership to gradually transfer programmatic and financial responsibilities for the Laboratory Center to UB</li> </ul>

## Detailed Objectives, Activities, and Timeline

### Capacity Strengthening in Botswana

#### YEARS 1-3 (JULY 2022 – JUNE 2025):

- The BUP-supported Laboratory Center in the UB Faculty of Health Sciences will continue to: (a) provide a training and mentoring platform for approximately one UB PhD and two master students per year; and (b) support Batswana investigators with testing and analyses in biochemistry, genetics, and molecular biology.

#### YEARS 2-3 (JULY 2023 – JUNE 2025):

- If additional funding becomes available, the Laboratory Center will recruit one Batswana post-doctoral fellow and purchase additional equipment (such as a qPCR machine and a DNA sequencing machine). These investments will allow the Laboratory Center to increase the number and expand the scope of its research projects on pharmacogenetics and pharmacogenomics, malaria transmission and resistance, neglected tropical diseases, and one health.

#### YEARS 4-5 (JULY 2025 – JUNE 2027):

- If additional funding becomes available, the Laboratory Center will seek to engage investigators from neighboring countries and establish itself as a center of excellence for pharmacogenetics and pharmacogenomics in the Sub-Saharan African region.

### Capacity Strengthening at Penn

#### YEAR 1 (JULY 2022 – JUNE 2023):

- The Laboratory Center will provide a training and mentoring platform for one Penn PhD student and one CHOP research fellow working on a project that applies mass spectrometry to study arbovirus transmission. The Laboratory Center will also continue to support Penn/CHOP investigators with testing and analyses in biochemistry, genetics, and molecular biology.

#### YEARS 2-5 (JULY 2023 – JUNE 2027):

- The Laboratory Center will seek to increase the number of Penn/CHOP faculty supported and Penn/CHOP trainees supported by the Center.

## Knowledge Generation

YEARS 1-3 (JULY 2022 – JUNE 2025):

- The main area of inquiry will be: (a) arbovirus transmission; (b) cancer pharmacogenetics and pharmacogenomics; (c) infectious diseases pharmacogenetics and pharmacogenomics; (d) malaria transmission and resistance; (e) neglected tropical diseases; and (e) one health.
- The projected scientific output from the Laboratory Center will be approximately five publications per year.

YEARS 2-5 (JULY 2023 – JUNE 2027):

- The Laboratory Center will conduct a cohort study on malaria transmission in the Gokwe District of Zimbabwe.

## Strengthen the Partnership

YEARS 1-3 (JULY 2022 – JUNE 2025):

- BUP and UB (through the Faculties of Medicine and Health Sciences) will develop and execute a sustainability plan for the Laboratory Center that gradually transfers programmatic and financial responsibilities from BUP to UB.

## 3. Pathology

### Overarching Objectives and Activities

Goal	Overarching Objectives/Activities
<i>Health Service Delivery</i>	<ul style="list-style-type: none"><li>• Resume and sustain provision of clinical care through rotating Penn faculty and residents</li></ul>
<i>Capacity Strengthening in Botswana</i>	<ul style="list-style-type: none"><li>• Resume training, mentoring, and supervision of UB Master in Medicine and medical students by Penn faculty and trainees both in person and virtually</li><li>• Support the establishment of telemedicine systems/services in anatomic pathology</li></ul>
<i>Capacity Strengthening at Penn</i>	<ul style="list-style-type: none"><li>• Resume and sustain the engagement of Penn faculty and trainees</li></ul>
<i>Knowledge Generation</i>	<ul style="list-style-type: none"><li>• Pursue research projects based on needs/questions identified at point of care, guidance from partners, and funding availability</li></ul>
<i>Strengthen the Partnership</i>	<ul style="list-style-type: none"><li>• Work closely with the MOHW and UB on the pursuit of shared objectives, fundraising, and the execution of a sustainability plan to enhance country ownership</li></ul>

### Detailed Objectives, Activities, and Timeline

#### Health Service Delivery

YEARS 1-3 (JULY 2022 – JUNE 2025):

- The bi-annual trips by approximately two Penn pathology residents and Prof. Kum Cooper (Penn Professor of Pathology and Laboratory Medicine) will resume after a two-year hiatus due to the COVID-19 pandemic (approximately four weeks per rotation). During their time in Botswana, these residents and Prof. Cooper will provide clinical care



in the pathology service at Princess Marina Hospital (PMH) and Sir Ketumile Masire Teaching Hospital (SKMTH) in Gaborone.

#### Capacity Strengthening in Botswana and at Penn

YEARS 1-3 (JULY 2022 – JUNE 2025):

- The Penn pathology residents will work side by side with UB Master in Medicine (MMed) students and will train and mentor at point of care medical students. At the same time, they will also gain significant exposure to global health, which might inform future academic endeavors.

YEARS 2-3 (JULY 2023 – JUNE 2025):

- Prof Kum Cooper will work with the UB Pathology Department leadership and with the PMH and SKMTH leaderships to explore the establishment of telemedicine systems/services in anatomic pathology.

#### Knowledge Generation and Strengthen the Partnership

YEARS 1-3 (JULY 2022 – JUNE 2025):

- Prof Kum Cooper will meet with the UB Pathology Department leadership to: (a) assess progress on the previous year’s objectives and activities and revise BUP’s strategic plan as needed for the following years; (b) develop/execute sustainability plans for all current projects and promote country ownership.

YEARS 2-3 (JULY 2023 – JUNE 2024):

- The Penn radiology faculty and trainees will pursue research projects based on needs/questions identified at point of care, guidance from partners at UB and the MOHW, and funding availability (there are currently no research projects being conducted in country through BUP).

YEARS 2-5 (JULY 2023 – JUNE 2027):

- Two UB MMed students per year may spend a month at the Hospital of University of Pennsylvania (HUP) as clinical observers on the pathology service.

## 4. Radiology

### Overarching Objectives and Activities

Goal	Overarching Objectives/Activities
<i>Health Service Delivery</i>	<ul style="list-style-type: none"> <li>• Continue and expand provision of clinical care through rotating Penn and CHOP faculty, clinical fellows, and residents</li> <li>• Seek to further expand provision of clinical care through rotating U.S. radiology specialists from academic institutions other than Penn and CHOP</li> </ul>
<i>Capacity Strengthening in Botswana</i>	<ul style="list-style-type: none"> <li>• Support the launch of a Master in Medicine (MMed) program in radiology</li> <li>• Continue training, mentoring, and supervision of UB Master in Medicine and medical students by Penn and CHOP faculty and trainees both in person and virtually</li> <li>• Support the establishment of a picture archiving and communication system in Botswana’s main teaching hospitals</li> </ul>

<b><i>Capacity Strengthening at Penn</i></b>	<ul style="list-style-type: none"> <li>Continue and expand the engagement of Penn and CHOP faculty and trainees</li> </ul>
<b><i>Knowledge Generation</i></b>	<ul style="list-style-type: none"> <li>Pursue research projects based on needs/questions identified at point of care, guidance from partners, and funding availability</li> </ul>
<b><i>Strengthen the Partnership</i></b>	<ul style="list-style-type: none"> <li>Formalize agreement with U.S. non-profit RAD-AID to deploy additional U.S. radiology specialists to Botswana</li> <li>Work closely with the MOHW and UB on the pursuit of shared objectives, fundraising, and the execution of a sustainability plan to enhance country ownership</li> </ul>

Detailed Objectives, Activities, and Timeline

Health Service Delivery

YEARS 1-5 (JULY 2022 – JUNE 2027):

- Approximately two Penn radiology residents per year will continue to rotate in Botswana (approximately four weeks per rotation) to provide clinical care in the radiology service at Princess Marina Hospital (PMH) and Sir Ketumile Masire Teaching Hospital (SKTMH) in Gaborone as well as Letsholathebe Memorial Hospital (LMH) in Maun.

YEARS 2-5 (JULY 2023 – JUNE 2027):

- Penn radiology fellows and CHOP radiology residents and fellows may start rotating in Botswana to provide clinical care (if the Penn/CHOP Radiology Lead reaches an agreement with the Penn/CHOP Radiology Departments/Divisions).
- Radiology faculty, fellows, and residents from other U.S. academic institutions may start rotating in Botswana to provide clinical care. The U.S. non-profit RAD-AID would be responsible for recruiting them and deploying them to Botswana while (once in country) BUP would be responsible for hosting and orienting them, processing their paperwork, and linking them to the UB Department of Radiology and the leadership at the health facilities where they will be working. The achievement of this objective depends on the finalization of a formal agreement between RAD-AID and the MOHW and between RAD-AID and BUP, which has not occurred yet.
- Physicians at PMH and SKMTH in Gaborone and LMH in Maun will be able to participate in radiology grand rounds at Penn and share complex cases with Penn/CHOP radiology faculty and trainees in a virtual format.

Capacity Strengthening in Botswana

YEARS 1-3 (JULY 2022 – JUNE 2025):

- The Penn/CHOP Radiology Lead (Dr Abass Noor) will work with the UB Radiology Department leadership and the PMH leadership to establish a picture archiving and communication system (PACS).

YEARS 1-5 (JULY 2022 – JUNE 2027):

- The Penn/CHOP Radiology Lead (Dr Abass Noor) will work with the UB Radiology Department leadership to launch a Master in Medicine program in radiology by supporting/advising on curricular revisions, providing access to online educational

material and virtual mentoring by Penn/CHOP radiology faculty, and deploying Penn/CHOP radiology faculty and fellows.

- The Penn radiology residents will work side by side with UB MMed students and provide training and mentoring at point of care to medical students.

YEARS 2-5 (JULY 2023 – JUNE 2027):

- Penn radiology fellows, CHOP radiology residents and fellows, and U.S. radiology faculty, fellows, and residents recruited by RAD-AID may also rotate in Botswana and help strengthen local capacity through twinning, training, and mentoring at point of care (the agreement with RAD-AID has not been finalized yet).
- Two UB MMed students per year may spend a month at the Hospital of University of Pennsylvania (HUP) or CHOP as clinical observers on the radiology service.

### Capacity Strengthening at Penn

YEARS 1-5 (JULY 2022 – JUNE 2027):

- Approximately two Penn radiology residents per year will continue rotate in Botswana and gain exposure to global health, which might inform future academic endeavors.

YEARS 2-5 (JULY 2023 – JUNE 2027):

- Penn radiology fellows and CHOP radiology residents and fellows may start rotating in Botswana and gain exposure to global health (these rotations have not been finalized yet).
- Penn radiology faculty and trainees will be able to consult on complex cases from Botswana in a virtual format.

### Knowledge Generation

YEARS 1-5 (JULY 2022 – JUNE 2027):

- The Penn/CHOP Radiology Lead will work with the UB Radiology Department leadership to identify Penn/CHOP radiology faculty and fellows who can mentor UB MMed students with their research/capstone projects.

YEARS 2-5 (JULY 2023 – JUNE 2027):

- Penn radiology faculty and trainees will pursue research projects based on needs/questions identified at point of care, guidance from partners at UB and the MOHW, and funding availability.

### Strengthen the Partnership

YEARS 1-2 (JULY 2022 – JUNE 2024):

- The Penn/CHOP Radiology Lead and the UB Radiology Department leadership will work with the RAD-AID leadership to finalize a formal agreement between RAD-AID and the MOHW and between RAD-AID and BUP.

YEARS 1-5 (JULY 2022 – JUNE 2027):

- The Penn/CHOP Radiology Lead and the UB Radiology Department leadership will hold annual meetings with the MOHW leadership and other key stakeholders in Botswana to:  
(a) assess progress on the previous year's objectives and activities and revise BUP's

strategic plan as needed for the following years; (b) develop/execute sustainability plans for all current projects and promote country ownership.

## SECTION 4C: HIGHLIGHTS BY AREA OF ENGAGEMENT

### GENERAL INTERNAL MEDICINE AND OTHER SUB-SPECIALTIES

#### Overarching Objectives and Activities

Goal	Overarching Objectives/Activities
<i>Health Service Delivery</i>	<ul style="list-style-type: none"> <li>Continue and expand provision of clinical care for general internal medicine through rotating Penn faculty and residents</li> <li>Expand provision of clinical care across the main subspecialty areas (cardiology, endocrinology, nephrology, neurology, rheumatology, pulmonary critical care, and other subspecialty areas) through rotating Penn faculty and clinical fellows</li> </ul>
<i>Capacity Strengthening in Botswana</i>	<ul style="list-style-type: none"> <li>Continue and expand training, mentoring, and supervision of UB Master in Medicine and medical students by Penn faculty and trainees both in person and virtually</li> <li>Support curricular revisions at UB across the main subspecialty areas and develop module on leadership and management</li> <li>Support the establishment of certificate programs across the main subspecialty areas targeting practicing clinicians and possibly the establishment of clinical fellowship programs at UB</li> </ul>
<i>Capacity Strengthening at Penn</i>	<ul style="list-style-type: none"> <li>Continue and expand the engagement of Penn faculty and trainees</li> <li>Support the establishment of a global health fellowship in general internal medicine for junior faculty</li> </ul>
<i>Knowledge Generation</i>	<ul style="list-style-type: none"> <li>Pursue research projects based on needs/questions identified at point of care, guidance from partners, and funding availability</li> </ul>
<i>Strengthen the Partnership</i>	<ul style="list-style-type: none"> <li>Work closely with the MOHW and UB (and possibly other U.S. academic institutions with projects in Botswana) on the pursuit of shared objectives, fundraising, and the execution of a sustainability plan to enhance country ownership</li> </ul>

#### Detailed Objectives, Activities, and Timeline

##### Background

- Due to a severe shortage of internal medicine subspecialists in Botswana serving as trainers and clinical mentors, all UB Master in Medicine students (MMed students) spend two years in South Africa to learn about cardiology, endocrinology, nephrology, neurology, rheumatology, pulmonary critical care, and other subspecialty areas. This arrangement is very expensive to the Government of Botswana, threatens retention of the health workforce (as several newly trained Botswana subspecialists opt to remain in South Africa upon graduation), and deprives already severely under-staffed teaching hospitals in Botswana of rare and valuable clinicians. Prof. Paul Mather and Dr Vikram Palanivel (both faculty at the Division of Cardiovascular Diseases of the Penn Medicine Department) will lead BUP's new effort to strengthen the training capacity of the UB Medicine Department.

## Health Service Delivery and Capacity Strengthening in Botswana

### YEAR 1 (JULY 2022 – JUNE 2023):

- Approximately six to eight Penn internal medicine residents per year will continue to rotate in Botswana (approximately four weeks per rotation) to provide clinical care in the medicine service at Princess Marina Hospital (PMH) and Sir Ketumile Masire Teaching Hospital (SKMTH) in Gaborone and possibly (at a later stage) Letsholathebe Memorial Hospital (LMH) in Maun. These residents will also work side by side with UB Master in Medicine (MMed) students and will train and mentor at point of care medical students.
- Penn internal medicine subspecialists and fellows will start rotating in Botswana (approximately two weeks per rotation) to train and mentor at point of care UB MMed students and medical students. During their time in Botswana, they will also provide clinical care in the consultation services for their respective subspecialties in the same hospitals. The number of Penn internal medicine subspecialists and fellows rotating and the types of subspecialty areas covered in Year 1 has not been determined yet (probably around two rotations per subspecialty area and three different subspecialty areas).

### YEARS 2-3 (JULY 2023 – JUNE 2025):

- The number of Penn internal medicine subspecialists and fellows will increase. All the main subspecialty areas (cardiology, endocrinology, nephrology, neurology, rheumatology, pulmonary critical care) will be covered. Additionally, BUP and UB may opt to reach out to other U.S. academic institutions (such as Baylor College of Medicine, Harvard University, working in Botswana, Rutgers University, and University of Maryland) working in Botswana to further increase the number of rotating U.S. internal medicine subspecialists and fellows.
- The Penn internal medicine subspecialists and fellows will help the UB Medicine Department leadership revise the curriculum of the MMed program and develop modules for their respective subspecialty areas.
- Senior UB MMed students with a strong interest in certain subspecialty areas may receive intensive training and clinical mentoring at point of care (complemented by online teaching as well). These investments would prepare them to function semi-independently of the Penn internal medicine subspecialists and fellows and take over some of their clinical and teaching responsibilities upon graduation.
- The curriculum of the UB MMed Program will be further enhanced with the addition of a leadership and management module. This module will be designed to prepare the UB MMed students for the challenge of working in chronically under-resourced public sector facilities and take on programmatic responsibilities whenever necessary. The same module will be delivered as a separate certificate program to Botswana physicians and health administrators to further strengthen leadership and management capacity in public sector facilities.

### YEARS 3-4 (JULY 2024 – JUNE 2026):

- BUP and UB will explore the establishment of certificate programs for some subspecialty areas targeting practicing clinicians (primarily general practitioners, internal medicine

specialists, and family medicine specialists). Once launched, these programs could be developed into clinical fellowship programs at a later stage.

#### YEAR 4 (JULY 2025 – JUNE 2026)

- the number of Penn internal medicine subspecialists and fellows will likely remain stable and in

#### YEAR 5 (JULY 2026 – JUNE 2027)

- it may start decreasing, as the number of newly graduated Botswana internal medicine specialists increases.

### Capacity Strengthening at Penn and Knowledge Generation

#### YEARS 1-5 (JULY 2022 – JUNE 2027):

- The Penn internal medicine subspecialists and trainees rotating in Botswana will gain exposure to global health, which might inform future academic endeavors (including research projects in their respective subspecialty areas).

#### YEARS 3-5 (JULY 2024 – JUNE 2027):

- BUP will work closely with the leaderships of PSOM/CGH and the Penn Medicine Department to establish a global health fellowship in general internal medicine for junior faculty.

### Strengthen the Partnership

#### YEARS 1-5 (JULY 2022 – JUNE 2027):

- Prof Mather, Dr Palanivel, and the UB Medicine Department leadership will hold annual meetings with the MOHW leadership and other key stakeholders in Botswana to: (a) assess progress on the previous year's objectives and activities and revise BUP's strategic plan as needed for the following years; (b) develop/execute sustainability plans for all current projects and promote country ownership.

## SECTION 4D: HIGHLIGHTS BY AREA OF ENGAGEMENT

### INFECTIOUS DISEASES

#### Overarching Objectives and Activities

Goal	Overarching Objectives/Activities
<b>Health Service Delivery</b>	<ul style="list-style-type: none"> <li>• Continue and expand provision of clinical care through rotating Penn and CHOP faculty and clinical fellows</li> <li>• Continue to leverage the findings from research and quality improvement projects to improve practices for clinical care and public health               <ul style="list-style-type: none"> <li>○ <b>IMPALA Study:</b> determine prevalence of colonization with and risk factors for extended spectrum cephalosporin-resistant enterobacterales (ESCrE) and carbapenem-resistant enterobacterales (CRE) in hospital, clinic, and community settings.</li> <li>○ <b>NIMBi Study:</b> reduce incidence/prevalence of sepsis in hospitalized neonates</li> <li>○ <b>Ntemoga Study:</b> improve neurocognitive screening and support in children affected by HIV</li> <li>○ <b>SHARE Program:</b> (a) establish systems for automated culture incubation/identification and antimicrobial sensitivity testing in public sector facilities; (b) develop, implement, and evaluate evidence-based interventions to reduce the risk of colonization and hospital-acquired infections from multi-drug resistant organisms</li> <li>○ <b>Tlotloetso Trial:</b> provide services (mostly telephone-based) for smoking cessation in HIV+ smokers</li> </ul> </li> </ul>
<b>Capacity Strengthening in Botswana</b>	<ul style="list-style-type: none"> <li>• Continue training, mentoring, and supervision of UB Master in Medicine and medical students by Penn and CHOP faculty and clinical fellows both in person and virtually</li> <li>• Continue to support Botswana investigators and trainees with their research projects (<b>HIV and Nutrition Study, IMPALA Study, NIMBbi Study, Ntemoga Study, and SHARE Program</b>)</li> <li>• Strengthen laboratory capacity for microbiology testing through procurement of equipment and supplies and training of MOHW staff in public sector facilities (<b>IMPALA Study and SHARE Program</b>)</li> <li>• Continue to support the submission of new funding opportunities for Botswana investigators in a master of science in clinical epidemiology (MSCE) in HIV from Penn or an epidemiology certificate training (ECT) in HIV from Botswana</li> <li>• Support the establishment of a clinical fellowship program in infectious diseases at UB</li> </ul>
<b>Capacity Strengthening at Penn</b>	<ul style="list-style-type: none"> <li>• Continue and expand the engagement of Penn and CHOP faculty and trainees</li> </ul>
<b>Knowledge Generation</b>	<ul style="list-style-type: none"> <li>• Complete current research and quality improvement projects and disseminate findings               <ul style="list-style-type: none"> <li>○ <b>AMS Study:</b> evaluate current antibiotic use and the effect of standardized practices in the pediatric surgical unit</li> <li>○ <b>CFAR Pilot Study:</b> compare the brain structure of HIV-exposed uninfected (HEU) and HIV un-exposed uninfected (HUU) neonates</li> <li>○ <b>IMPALA Study:</b> surveillance of ESCrE and CRE in hospital, clinic, and community settings</li> <li>○ <b>MOSAIC Study:</b> assess and improve current antibiotic stewardship (AS) practices in selected inpatient public sector facilities</li> </ul> </li> </ul>



	<ul style="list-style-type: none"> <li>○ <i>NIMBi Study</i>: assess the incidence/prevalence of colonization with organisms causing sepsis in hospitalized neonates, determine impact of HIV exposure, and implement evidence-based interventions to reduce the risk of colonization and hospital-acquired infections</li> <li>○ <i>Ntemoga Study</i>: compare the neurocognitive function of HEU and HUU children and assess the effectiveness of neurocognitive rehabilitation strategies</li> <li>○ <i>Tlotloetso Trial</i>: compare two different behavioral interventions for smoking cessation in HIV+ smokers</li> <li>● Pursue additional research projects based on needs/questions identified at point of care, guidance from partners, and funding availability</li> </ul>
<b>Strengthen the Partnership</b>	<ul style="list-style-type: none"> <li>● Work closely with the MOHW, UB, and other key stakeholders in Botswana on the pursuit of shared objectives, fundraising, and the execution of a sustainability plan to enhance country ownership</li> </ul>

Detailed Objectives, Activities, and Timeline

Health Service Delivery

- Approximately four to six Penn/CHOP and other BUP-affiliated infectious diseases specialists and fellows will continue to rotate in Botswana (approximately one week per rotation) to provide clinical care at Princess Marina Hospital (PMH) in Gaborone and occasionally at Letsholathebe Memorial Hospital (LMH) in Maun in Years 1-5 (July 2022 – June 2027).
- All research and quality improvement projects led or supported by BUP will continue to strengthen health service delivery by embedding lessons learned and new evidence into best practices for clinical care and public health.

IMPALA STUDY

- The ultimate goals of this project is to determine the prevalence of colonization with and risk factors for extended spectrum cephalosporin-resistant enterobacterales (ESCrE) and carbapenem-resistant enterobacterales (CRE) in hospital, clinic, and community settings.

NIMBI STUDY

- The ultimate goal of this project is to reduce the incidence/prevalence of sepsis on hospitalized neonates.

NTEMOGA STUDY:

- The ultimate goal of this project is to improve neurocognitive screening and support for children affected by HIV.

SHARE PROGRAM

- This project will help establish systems for automated culture incubation/identification and antimicrobial sensitivity testing. These systems will detect colonization and health-care associated infections (HAIs) with multi-drug resistant organisms (MDROs) at PMH in Gaborone and Nyangabwe Referral Hospital (NRH) in Francistown in Year 1 (July 2022 – June 2023) and other hospitals (to be determined) in Years 2-4 (July 2023 – June 2026).

- In the same hospitals, the project will help develop, implement, and evaluate (in collaboration with the NIMBi Study) a comprehensive set (or “bundle”) of evidence-based interventions to reduce the risk of colonization and HAIs.
- The ultimate goal of the project is reduce the incidence/prevalence of HAIs in Botswana.

#### TLOTLOETSO TRIAL

- No smoking cessation programs exist in Botswana. This trial not only provides HIV+ Botswana with the tools to quit smoking, but it is also designed with implementation in mind. It is mostly telephone based, a key aspect for a large rural country where centralized resources often fail to reach the dispersed community.

#### Capacity Strengthening in Botswana and at Penn

- The Penn infectious diseases subspecialists and fellows rotating in Botswana will train and mentor at point of care UB Master in Medicine (MMed) students and medical students in Years 1-5 (July 2022 – June 2027). They will also gain exposure to global health, which might inform future academic endeavors.
- All research and quality improvement projects led or supported by BUP will serve as a platform to train, mentor, and support the career development of clinicians, public health experts, laboratory personnel, and investigators in Botswana and at Penn/CHOP and other U.S. academic institutions working through BUP.

#### HIV AND NUTRITION STUDY

- This project will support the research project of Maemo Leasiapeto (MOHW personnel) on the nutritional status of adolescents and young adults with perinatally-acquired HIV in Year 1 (July 2022 – June 2023).

#### IMPALA STUDY

- This project will strengthen the capacity of the clinical laboratory at PMH and of the National Health Laboratory (NHL) in Gaborone to perform accurate and consistent microbiology testing (including DNA sequencing) in Years 1-2 (July 2022 – June 2024).

#### NTEMOGA STUDY

- This project will support the research projects of Dr Lingani Mbakile-Mahlanza (UB faculty), Dr Billy Tsima (UB faculty), and Shathani Rampa (Botswana PhD student) in Year 1 (July 2022 – June 2023). Each one of these investigators is expected to publish an article as a first author in the same timeframe.

#### SHARE PROGRAM

- This project will launch a “Basics of Hospital Epidemiology” certificate training as continuing education (CE) for hospital infection prevention and control (IPC) teams and anti-microbial sensitivity (AMS) committees in Year 1 (July 2022 – June 2023).
- The project will train all microbiology laboratory technicians on automated culture incubation/identification and antimicrobial sensitivity testing at PMH in Gaborone and NRH in Francistown in Year 1 (July 2022 – June 2023) and other hospitals (to be determined) in Years 2-4 (July 2023 – June 2026).

- The project will help establish data management systems in the microbiology laboratory at PMH in Gaborone and NRH in Francistown in Year 1 (July 2022 – June 2023) and other hospitals (to be determined) in Years 2-4 (July 2023 – June 2026).
- The project will help establish a national anti-microbial resistance (AMR) database with input from public and private laboratories in Year 2 (July 2023 – June 2024).
- The project will support research projects on AMR for one-two UB Master students per year in Years 2-3 (July 2023 – June 2025) and for two UB PhD students in Years 4-5 (July 2025 – June 2027).

#### TLOTLOETSO TRIAL

- This trial has trained three Batswana providers in the delivery of both standard and the experimental Behavioral Activation Problem Solving smoking cessation counseling techniques. Once they complete their work for BUP and the trial, they will be available for hiring by the MOHW or other stakeholders given their specialized skill in helping Batswana quit smoking tobacco.
- BUP will also pursue the renewal of the D43 international research training grant focused on mid-career investigators in Botswana who lack the mentored environment to pursue their own research grants. This grant will also provide additional slots to Batswana investigators to graduate from a master of science in clinical epidemiology (MSCE) in HIV from Penn (as the budget can accommodate) or an epidemiology certificate training (ECT) in HIV from Botswana in Years 1-2 (July 2022 – June 2024).
- The BUP Infectious Diseases Team may work with the UB Medicine Department leadership to establish an infectious diseases fellowship in Botswana in Years 4-5 (July 2025 – June 2027).

#### Knowledge Generation

##### AMS STUDY (CHOP GLOBAL HEALTH PILOT STUDY):

- This project will be led by Dr Bedada and Dr Kitt from CHOP and evaluate current antibiotic use and the effect of standardized practices in the pediatric surgical unit at PMH in Gaborone in Year 1 (July 2022 – June 2023).

##### CFAR PILOT STUDY

- This project will be led by Dr Otero from CHOP and compare the brain structure of HIV-exposed uninfected (HEU) and HIV un-exposed uninfected (HUU) neonates in Year 1 (July 2022 – June 2023).

##### IMPALA STUDY

- This project will perform surveillance of ESCrE and CRE in hospital, clinic, and community settings and identify both risk factors for colonization and potential targets for intervention in Years 1-2 (July 2022 – June 2024).

##### MOSAIC STUDY

- This project will assess current antibiotic stewardship (AS) practices in selected inpatient public sector facilities (with a special focus on acute care) and develop and test strategies to improve these practices based on the assessment's findings in Years 1-2 (July 2022 – June 2024).

- This project may be extended to clinics and communities from these facilities' catchment areas in Years 3-4 (July 2024 – June 2026).

#### NIMBI STUDY

- This project will assess the incidence/prevalence of colonization with organisms causing sepsis in hospitalized neonates and determine how HIV exposure and maternal transfer of antibodies influence the risk of colonization and sepsis in Year 1 (July 2022 – June 2024). The projected scientific output will be approximately three publications in the same timeframe (on the epidemiology of neonatal sepsis, the association of sepsis with neonatal antibody levels, and the association of sepsis with environmental factors and HIV exposure).
- The project will help develop, implement, and evaluate (in collaboration with the SHARE Program) a comprehensive set (or “bundle”) of evidence-based interventions to reduce the risk of colonization and HAIs in Year 2 (July 2023 – June 2024).
- The project may evolve to compare in a randomized trial the preventive effects of AZT and “bundle” interventions on the risk of sepsis in hospitalized neonates in Year 3 (July 2024 – June 2025).

#### NTEMOGA STUDY

- This project will compare the neurocognitive function of HEU and HUU children in Year 1 (July 2022 – June 2023)
- The project will begin to evaluate the effectiveness of neurocognitive rehabilitation in children affected by HIV in Year 2 (July 2023 – June 2024).

#### TLOTLOETSO TRIAL

- This trial compares two different behavioral interventions for smoking cessation in HIV+ smokers. The results will be packaged for the MOHW to disseminate and implement as they see fit.
- Additional areas of inquiry pursued by BUP will be informed by the challenges encountered and the lessons learned by BUP-affiliated faculty and trainees as well as the availability of funding.

#### Strengthen the Partnership

- BUP will seek regular guidance from the MOHW leadership, the UB leadership, and the leadership at the health facilities where BUP-affiliated faculty and trainees are working in Years 1-5 (July 2022 – June 2027). Whenever possible, each project will have a plan to ensure that local partners are able to sustain activities and outcomes after the project's termination.
- Additionally, these projects will be integrated with national and regional projects, networks, alliances, and platforms.
- The MOSAIC Study will expand its activities to sites in South Africa and Zimbabwe in Year 2 (July 2023 – June 2024).
- The SHARE Program will help establish a network of IPC teams and AS committees in Botswana and will collaborate with the National Institute for Communicable Diseases (NICD) in South Africa in Years 1-2 (July 2022 – June 2024).



## SECTION 4E: HIGHLIGHTS BY AREA OF ENGAGEMENT

### CLINICAL ONCOLOGY AND RADIATION ONCOLOGY

#### Health Service Delivery

Year 1 (July 2022 – June 2023):

- The BUP Oncology Team will strengthen the systems to support cancer patients, help them navigate the health system, and link them to care.
- The BUP Oncology Team will provide evidence-concordant clinical care in cancer patients undergoing three-dimensional conformal therapy (CRT) for advanced disease.
- There is a high likelihood of funding of a U01 grant to launch an implementation science study to enhance access and quality of care for cervical cancer in HIV+ women. If funded, this study will not only directly benefit Botswana women who have both HIV and cervical cancer, but it will also generate new knowledge on how to roll out cervical cancer care in Sub-Saharan Africa. Dr Surbhi Grover and Dr Katharine Rendle are expected to serve as Principal Investigators.

#### Capacity Strengthening in Botswana and at Penn

Year 1 (July 2022 – June 2023):

- The BUP Oncology Team will engage UB and BUP-affiliated faculty and trainees in ongoing research, training, and health service delivery activities related to oncology.

#### Knowledge Generation

Year 1 (July 2022 – June 2023):

- The BUP Oncology Team will enhance the dissemination of the findings from all current projects to the leadership and oncologists at Princess Marina Hospital (PMH) in Gaborone, the Cancer Advisory Board (CAB), the MOHW leadership, and the UB Faculty of Medicine leadership.

#### Strengthen the Partnership

Year 1 (July 2022 – June 2023):

- The BUP Oncology Team will work closely with the leadership and oncologists at PMH in Gaborone, the Cancer Advisory Board, the MOHW leadership, and the UB Faculty of Medicine leadership to ensure alignment of ongoing activities and current projects with local priorities and monitor progress towards sustainability.

## SECTION 4F: HIGHLIGHTS BY AREA OF ENGAGEMENT

### GENERAL PEDIATRICS, ADOLESCENT MEDICINE, AND OTHER SUB-SPECIALTIES

#### Overarching Objectives and Activities

Goal	Overarching Objectives/Activities
<i>Health Service Delivery</i>	<ul style="list-style-type: none"> <li>• Continue and expand provision of clinical care for general and subspecialty pediatrics through Botswana-based CHOP faculty and global health fellows and rotating CHOP faculty and residents</li> <li>• Expand provision of clinical care across several specialty and subspecialty areas (adolescent medicine, cardiology, infectious diseases, mental health, neonatal care, primary care, and surgery)</li> <li>• Support the establishment of a neonatal intensive care unit at Sir Ketumile Masire Teaching Hospital (SKMTH)</li> </ul>
<i>Capacity Strengthening in Botswana</i>	<ul style="list-style-type: none"> <li>• Continue training, mentoring, and supervision of UB Master in Medicine and medical students by CHOP faculty and trainees both in person and virtually</li> <li>• Advance neonatal nursing skills in Botswana starting with PMH and SKMTH towards the establishment of a master program in neonatal nursing</li> <li>• Support the initial establishment of certificate programs across the main pediatric subspecialty areas (adolescent medicine, cardiology, infectious diseases, neurology, etc.) and their later evolution into clinical fellowship programs at UB</li> <li>• Enhance the educational experience for UB MMed students and medical students of having CHOP faculty and trainees through curricular revisions and novel training opportunities</li> <li>• Continue to support the career development of UB faculty through multiple avenues (training, participation in conferences, access to CHOP pilot grants, etc.)</li> </ul>
<i>Capacity Strengthening at Penn</i>	<ul style="list-style-type: none"> <li>• Continue and expand the engagement of CHOP faculty and trainees across several specialty and subspecialty areas</li> <li>• Enhance the educational experience for CHOP residents through orientation and curricular revisions</li> <li>• Establish and sustain a global health fellowship program for nurses at CHOP to advance neonatal skills in Botswana</li> </ul>
<i>Knowledge Generation</i>	<ul style="list-style-type: none"> <li>• Complete ongoing projects and publish/disseminate the results               <ul style="list-style-type: none"> <li>○ <i>CFAR Pilot Study</i>: compare the brain structure of HIV-exposed uninfected (HEU) and HIV un-exposed uninfected (HUU) neonates</li> <li>○ <i>HIV and Nutrition Study</i>: assess the nutritional status of adolescents and young adults with perinatally-acquired HIV</li> <li>○ <i>NIMBi Study</i>: assess the incidence/prevalence of colonization with organisms causing sepsis in hospitalized neonates, determine impact of HIV exposure, and implement evidence-based interventions to reduce the risk of colonization and hospital-acquired infections</li> <li>○ <i>Nemoga Study</i>: compare the neurocognitive function of HEU and HUU children and assess the effectiveness of neurocognitive rehabilitation strategies</li> </ul> </li> <li>• Increase the number of research projects across new areas of inquiry (adolescent medicine, antibiotic stewardship, HIV and tuberculosis, neonatal care and resuscitation, rehabilitation, etc.) that are co-led by a CHOP PI and Batswana PI</li> </ul>
<i>Strengthen the Partnership</i>	<ul style="list-style-type: none"> <li>• Coordinate with the UB Pediatrics Department leadership to monitor progress of the strategic plan, seek feedback on programmatic matters, and pursue</li> </ul>

## Detailed Objectives, Activities, and Timeline

### Health Service Delivery and Capacity Strengthening in Botswana

Years 1-3 (July 2022 – June 2025):

- The BUP Pediatrics Director and two to three full-time Botswana-based global health CHOP fellows per year will continue to provide clinical care (for approximately eight weeks per year) in the inpatient pediatrics service at Princess Marina Hospital (PMH) and Sir Ketumile Masire Teaching Hospital (SKMTH) in Gaborone and possibly (at a later stage) other health facilities (to be determined). During their time on service, they will also train and mentor at point of care UB MMed students and medical students. This contribution will be complemented CHOP pediatric subspecialists rotating in Botswana (approximately one week per rotation).
- Approximately six to eight CHOP pediatric residents per year will continue to rotate in Botswana (approximately four weeks per rotation) to provide clinical care in the same hospitals and health facilities. These residents will also work side by side with UB MMed students and will train and mentor medical students at point of care.
- BUP will seek to enhance the educational experience for UB MMed students and medical students of having CHOP faculty and trainees through curricular revisions for the rotations at PMH and novel training opportunities (for example at the District Health Management Team in the Greater Gaborone area).
- Continue to support the career development of UB faculty through multiple avenues, including (among others): (a) mentoring by CHOP faculty the strengthen clinical, educational, and research skills; (b) enrollment in intensive short courses sponsored by CHOP and the Open Medical Institute in Salzburg; (c) participation in CHOP's annual Global Health Conference; and (d) sponsorship of research projects through CHOP pilot grants in global health.
- Other areas of engagement will include: (a) adolescent medicine; (i) infectious diseases; (c) mental health; (d) neonatal care; (e) neurology; (f) primary care; and (g) surgery.
  - To increase access to adolescent medicine services, BUP will expand its activities to several youth friendly services (YFS) and infectious diseases control centers (IDCCs) in the Greater Gaborone area.
  - By training MOHW primary care providers in pediatric and adolescent psychology and psychiatry, BUP will seek to expand access to mental health services.
  - BUP will work with the MOHW and the leadership of PMH and other hospitals in Botswana to set up pediatric EEG services.
  - BUP will seek to advance neonatal nursing skills in Botswana starting with supporting continuing professional development programs for nurses at PMH and SKMTH. These programs will serve as the foundation towards the establishment of a master program in neonatal nursing.



- By training UB faculty and MMed students in neonatal resuscitation and advanced life support, BUP will seek to improve the quality of acute care for newborns and children
- BUP will work with the UB Pediatrics Department leadership, the SKMTH leadership, and other key stakeholders in Botswana to establish a neonatal intensive care unit (NICU) at SKMTH in Gaborone.

#### Years 3-5 (July 2024 – June 2027):

- The CHOP leadership and the BUP Pediatrics Director may work with the UB Pediatrics Department leadership to establish of certificate programs across the main pediatric subspecialty areas (adolescent medicine, cardiology, infectious diseases, neurology, etc.). These program may serve as the foundation for and be expanded into clinical fellowship programs at UB across the same subspecialty areas, with adolescent medicine and cardiology as the most likely first targets.

### Capacity Strengthening at Penn

#### Years 1-3 (July 2022 – June 2025):

- The CHOP pediatric faculty and trainees working and rotating in Botswana will gain exposure to global health, which might inform future academic endeavors (including research projects in their respective subspecialty areas). Over time, their engagement might expand to hospitals and health facilities outside of Gaborone.
- The CHOP leadership will seek to increase the number of CHOP pediatric subspecialists rotating in Botswana.
- The CHOP leadership will establish a global health fellowship program for nurses to support neonatal care in Botswana to advance neonatal skills in Botswana.

### Knowledge Generation

#### Years 1-3 (July 2022 – June 2025):

- The CHOP investigators and their Batswana colleagues and partners will seek to complete all ongoing projects and publish or disseminate the results. Among these projects are:

#### CFAR PILOT STUDY

- This project will be led by Dr Otero from CHOP and compare the brain structure of HIV-exposed uninfected (HEU) and HIV un-exposed uninfected (HUU) neonates in Year 1 (July 2022 – June 2023).

#### HIV AND NUTRITION STUDY

- This project will support the research project of Maemo Leasiapeto (MOHW personnel) on the nutritional status of adolescents and young adults with perinatally-acquired HIV in Year 1 (July 2022 – June 2023).

#### NIMBI STUDY:

- This project will assess the incidence/prevalence of colonization with organisms causing sepsis in hospitalized neonates, determine impact of HIV exposure, and implement

evidence-based interventions to reduce the risk of colonization and hospital-acquired infections.

#### NTEMOGA STUDY

- This project will compare the neurocognitive function of HEU and HUU children in Year 1 (July 2022 – June 2023)
- The project will begin to evaluate the effectiveness of neurocognitive rehabilitation in children affected by HIV in Year 2 (July 2023 – June 2024).
- The CHOP leadership and the BUP Pediatrics Director will seek to increase the number of research projects across new areas of inquiry (adolescent medicine, antibiotic stewardship, HIV and tuberculosis, rehabilitation, etc.). A special focus will be on neonatal care and resuscitation. These projects will transition from having a CHOP PI and a Batswana co-PI to being entirely led by a Batswana PI. The projected scientific output will be at least one article per project.
- CHOP pediatric faculty and the BUP Pediatrics Director will continue to mentor UB MMed students with their research /capstone projects.

#### Strengthen the Partnership

Years 1-5 (July 2022 – June 2027):

- BUP will continue to coordinate with the UB Pediatrics Department leadership to monitor progress of the strategic plan, seek feedback on programmatic matters, and pursue programmatic and financial sustainability on ongoing activities and current projects.
- Since the number of UB faculty has been increasing gradually over the past few years, CHOP's contribution may evolve over time, with less direct engagement by its faculty and trainees and more support of the UB Faculty of Medicine as an institution.
- This support will include assisting Batswana investigators in the pursuit of funding opportunities (such as publication awards and research grants) in Years 1-3 (July 2022 – June 2025) and assisting the UB Foundation's fundraising efforts in Years 4-5 (July 2025 – June 2027).
- Lastly, the CHOP leadership will seek to enhance South-South collaborations by sharing lessons learned and best practices across all of its global health programs (Botswana included) through conferences and training events (both in person and virtually).

## SECTION 4G: HIGHLIGHTS BY AREA OF ENGAGEMENT

### RESEARCH OPERATIONS

#### Overarching Objectives and Activities

Goal	Overarching Objectives/Activities
<i>Health Service Delivery</i>	<ul style="list-style-type: none"> <li>Seek to strengthen the link between research findings and improvements in access to/quality of care through: (a) enhanced dissemination of findings to clinicians and public health experts both by presenting at existing fora in Botswana and, where needed, helping create new fora; (b) diversification of research projects to include implementation research; (c) establishment/enhancement of health service delivery platforms where research activities are being conducted</li> </ul>
<i>Capacity Strengthening in Botswana</i>	<ul style="list-style-type: none"> <li>Continue to provide a training and mentoring platform for UB PhD and master students and a research platform for Botswana investigators through the BUP-supported Laboratory Center at UB</li> <li>Continue to mentor UB Master in Medicine students with their research/capstone projects</li> <li>Continue to support the enrollment of Botswana investigators in a master of science in epidemiology (MSCE) in HIV from Penn or an epidemiology certificate training (ECT) in HIV from Botswana</li> <li>Support the progression MSCE and ECT graduates towards becoming independent investigators and effective research collaborators, respectively</li> <li>Establishment of the Sedibeng (meaning “Well” or “Fountain” in Setswana) consultative service for Botswana investigators</li> </ul>
<i>Capacity Strengthening at Penn</i>	<ul style="list-style-type: none"> <li>Increase the number of Penn/CHOP investigators working in Botswana including using the Sedibeng consultative service to link new faculty not currently working in Botswana with Botswana trainees focused on work in their areas of expertise</li> </ul>
<i>Knowledge Generation</i>	<ul style="list-style-type: none"> <li>Pursue additional research projects based on needs/questions identified at point of care, guidance from partners, and funding availability</li> </ul>
<i>Strengthen the Partnership</i>	<ul style="list-style-type: none"> <li>Work closely with the main partners in Botswana (such as UB and the Community Advisory Board (CAB)) to pursue research projects and shared objectives aligned to local priorities, fundraise accordingly, and execute a sustainability plan to enhance country ownership</li> </ul>

#### Detailed Objectives, Activities, and Timeline

##### Health Service Delivery

YEARS 1- 3 (JULY 2022 – JUNE 2025):

- BUP will seek to strengthen the link between research findings and improvements in access to/quality of care through several avenues:
- Enhanced dissemination of findings to clinicians, public health experts, health administrators, and community members from the health facilities and communities where research activities are being conducted.
- Diversification of research projects to include implementation research, impact evaluation, monitoring and evaluation, and quality improvement activities, which have a more direct impact on access to/quality of care.

- Establishment/enhancement of health service delivery platforms where research activities are being conducted to include new specialties/subspecialties, health facilities, and geographical areas (starting with primary health care and rural health in Years 1-2 (July 2022 – June 2024).

### Capacity Strengthening in Botswana

YEARS 1- 3 (JULY 2022 – JUNE 2025):

- BUP will also continue to strengthen capacity in Botswana through several avenues:
- Through the BUP-supported Laboratory Center in the UB Faculty of Health Sciences: (a) continued provision of a training and mentoring platform for approximately one UB PhD and two master students per year; and (b) continued support of Batswana investigators with testing and analyses in biochemistry, genetics, and molecular biology and support Batswana investigators with testing and analyses in biochemistry, genetics, and molecular biology.
- Continued mentoring of UB Master in Medicine (MMed) students with their research/capstone projects.
- Pursuit of renewal of the D43 international research training grant allowing approximately eight Batswana investigators per year to graduate from a master of science in epidemiology (MSCE) in HIV from Penn or an epidemiology certificate training (ECT) in HIV from Botswana in Years 1-2 (July 2022 – June 2024).
- Ensuring that most research projects will transition from having a Penn/CHOP PI and a Batswana co-PI to being entirely led by a Batswana PI. A special focus will be on MSCE and ECT graduates who are expected to become independent investigators and proficient in collaborative research, respectively.
- Establishment of the Sedibeng (meaning “Well” or “Fountain” in Setswana) consultative service to support, train, and mentor UB faculty and MMed students as well as other key stakeholders in Botswana on study design, data collection/analysis, scientific writing, and dissemination of results in Years 1-2 (July 2022 – June 2024).

### Capacity Strengthening at Penn

YEARS 1-3 (JULY 2022 – JUNE 2025):

- BUP will increase the number of Penn/CHOP investigators working in Botswana and further enhance their engagement by facilitating:
- Research collaborations between approximately three Penn trainees per year either Batswana investigators or Penn investigators working in Botswana.
- Increases in the number of research projects across new areas of inquiry (community/school health, non-communicable diseases, implementation research, surgery, etc.) and possibly even disciplines/sectors outside of medicine/health (dentistry, nursing, veterinary medicine, etc.).

### Strengthen the Partnership

YEARS 1-3 (JULY 2022 – JUNE 2025):

- BUP will ensure the relevance, feasibility, and alignment to national priorities of research projects through engagement of the Community Advisory Board.

- BUP will continue to meet regularly with the UB Faculty of Medicine and Faculty of Health Sciences leaderships as well as other key stakeholders in Botswana to monitor progress of the strategic plan, seek feedback on programmatic matters, and pursue (whenever possible) programmatic and financial sustainability on ongoing activities and current projects (including the Laboratory Center).

## SECTION 4H: HIGHLIGHTS BY AREA OF ENGAGEMENT

### VULNERABLE POPULATIONS AND WOMEN’S HEALTH

#### 1. Primary Health Care and Rural Health

##### Overarching Objectives and Activities

Goal	Overarching Objectives/Activities
<i>Health Service Delivery</i>	<ul style="list-style-type: none"> <li>• Support (under the leadership of the MOHW and in close collaboration with local clinical and public health leaders, local communities, and UB) the implementation, evaluation, and quality improvement of community-based multi-disciplinary and multi-sectoral health interventions in the villages of Matsaudi and Phuduhudu (in the Ngamiland district)</li> <li>• Support the adoption and scale up of a community-based primary health care model to other villages and regions in Botswana</li> <li>• Support (if funding becomes available) the establishment of state of the art health systems in the Ngamiland district and/or the Okavango district that; (a) deliver high quality and comprehensive primary health care; and (b) address socio-economic and environmental determinants of health</li> </ul>
<i>Capacity Strengthening in Botswana</i>	<ul style="list-style-type: none"> <li>• Enhance the number of Botswana primary health care trainees (MMed students in Family and Community Health, PhD students in public health, nursing students, etc.) engaged in BUP-supported interventions and BUP activities</li> <li>• Support (if funding becomes available) the establishment of state of the art health systems in the Ngamiland district and/or the Okavango district that provides an ideal platform for training in primary health care and rural health</li> </ul>
<i>Capacity Strengthening at Penn</i>	<ul style="list-style-type: none"> <li>• Expand the engagement of Penn and CHOP faculty and trainees (for Penn, to possibly include public health as a discipline as well as schools and institutes outside of PSOM, such as Penn nursing and Penn veterinary medicine)</li> </ul>
<i>Knowledge Generation</i>	<ul style="list-style-type: none"> <li>• Evaluate the impact of current BUP-supported interventions and disseminate findings</li> <li>• Support (if funding becomes available) the establishment of state of the art health systems in the Ngamiland district and/or the Okavango district that provide an ideal platform for research in primary health care and rural health</li> </ul>
<i>Strengthen the Partnership</i>	<ul style="list-style-type: none"> <li>• Follow the lead of the MOHW and work closely with local clinical and public health leaders, local communities, and UB to monitor progress of the strategic plan, seek feedback on programmatic matters, fundraise, and pursue programmatic and financial sustainability on ongoing activities and current projects               <ul style="list-style-type: none"> <li>○ Possibly consolidate the agreed upon scope of work in a Memorandum of Understanding</li> </ul> </li> </ul>

#### Detailed Objectives, Activities, and Timeline

##### Health Service Delivery

##### YEAR 1 (JULY 2022 – JUNE 2023):

- Under the leadership of the MOHW and working closely with local communities, the District Health Management Team (DHMT) leadership, and the UB Department of Family Medicine and Public Health leadership, BUP will support the implementation and evaluation of community-based multi-disciplinary and multi-sectoral health

interventions in the villages of Matsaudi and Phuduhudu (in the Ngamiland district). These interventions will be informed by the findings of household assessments performed in both villages that capture health and socio-economic data.

#### YEAR 2-3 (JULY 2023 – JUNE 2025):

- BUP will continue to support the implementation and evaluation of the community-based multi-disciplinary and multi-sectoral health interventions in the same villages. BUP will also support the quality improvement of these interventions, which will be informed by the evaluation of the interventions' outcomes.
- If additional funding becomes available, BUP may seek to expand its activities to include other villages and rural health posts and clinics. If this expansion occurs, BUP may help the DHMT refurbish the infrastructure and equipment of these posts and clinics and strengthen the link between health facilities and surrounding communities through: (a) enhanced community outreach efforts; and (b) integration of household data with MOHW electronic medical records.

#### YEARS 4-5 (JULY 2025 – JUNE 2027):

- If additional funding becomes available, BUP may support the establishment of state of the art health systems in the Ngamiland district and/or the Okavango district (and possibly other rural areas in Botswana). These systems would deliver high quality and comprehensive primary health care and address socio-economic and environmental determinants of health. The main partners for this objective would be local communities, the DHMT leaderships, the MOHW leadership, the UB Faculty of Medicine leadership, and other key stakeholders in Botswana.

### Capacity Strengthening in Botswana

#### YEARS 1-3 (JULY 2023 – JUNE 2025):

- UB faculty and Master in Medicine (MMed) students (in both family medicine and public health) will participate in the implementation, evaluation, and quality improvement of the multi-disciplinary and multi-sectoral health interventions in Matsaudi and Phuduhudu.
- If additional funding becomes available, these faculty and students may also participate in activities in other villages and rural health posts and clinics. Botswana nursing students and other types of trainees may begin to participate as well.

#### YEARS 4-5 (JULY 2025 – JUNE 2027):

- If additional funding becomes available, BUP may support the establishment of state of the art health systems in the Ngamiland district and/or the Okavango district (and possibly other rural areas in Botswana) that would provide an ideal platform for training in primary health care and rural health. This training would emphasize the importance of teamwork, especially across disciplines within health (HIV and tuberculosis, maternal and child health, mental health, non-communicable diseases, primary care, etc.) and across sectors (agriculture, animal and environmental health, economy, housing, water and sanitation, etc.). This objective will be led by the MOHW and the main partners would be local communities, the DHMT leaderships, the UB Faculty of Medicine leadership, and other key stakeholders in Botswana.

## Capacity Strengthening at Penn

YEARS 2-5 (JULY 2023 – JUNE 2027):

- Penn/CHOP faculty and trainees may participate in primary health care and rural health activities if BUP's expansion to other villages and rural health posts and clinics occurs. Penn faculty from schools other than PSOM (for example, the School of Veterinary Medicine) may begin to may begin to participate as well.

## Knowledge Generation

YEARS 1-3 (JULY 2022 – JUNE 2025):

- BUP will support the completion of the household assessments in Matsaudi and Phuduhudu.
- If additional funding becomes available, BUP may seek to support the completion of household assessments in other villages.

YEARS 4-5 (JULY 2025 – JUNE 2027):

- If additional funding becomes available, BUP may support the establishment of state of the art health systems in the Ngamiland district and/or the Okavango district (and possibly other rural areas in Botswana) that would provide an ideal platform for research in primary health care and rural health. This research would emphasize the importance of collaboration, especially across disciplines within health (HIV and tuberculosis, maternal and child health, mental health, non-communicable diseases, primary care, etc.) and across sectors (agriculture, animal and environmental health, economy, housing, water and sanitation, etc.). This objective will be led by the MOHW and the main partners would be local communities, the DHMT leaderships, the UB Faculty of Medicine leadership, and other key stakeholders in Botswana.

## Strengthen the Partnership

YEARS 1-3 (JULY 2022 – JUNE 2025):

- BUP will continue to follow the lead of the MOHW and meet regularly with local communities, the DHMT leaderships, the UB Department Family Medicine and Public Health leadership, as well as other key stakeholders in Botswana. During these meeting BUP will monitor progress of the strategic plan, seek feedback on programmatic matters, and pursue programmatic and financial sustainability on ongoing activities and current projects.
- "Matching" funding will be sought from community trusts and private businesses to help sustain multi-disciplinary and multi-sectoral health interventions in Matsaudi, Phuduhudu, and other villages in the Ngamiland district and/or Okavango district.
- Philanthropic funding will be sought to help establish state of the art health systems in the Ngamiland district and/or Okavango district.



## SECTION 4I: HIGHLIGHTS BY AREA OF ENGAGEMENT

### OTHER AREAS

#### 1. Trauma and Rehabilitation

##### Overarching Objectives and Activities

Goal	Overarching Objectives/Activities
<i>Health Service Delivery</i>	<ul style="list-style-type: none"> <li>• Continue to support health service delivery at the Rehabilitation, Prosthetics, and Robotics Laboratory (RPRL) at Sir Ketumile Masire Teaching Hospital (SKMTH) in Gaborone               <ul style="list-style-type: none"> <li>○ Cognitive laboratory</li> <li>○ Motor laboratory</li> <li>○ Robotics laboratory</li> </ul> </li> <li>• Continue to support health service delivery in the Mahalapye District Hospital (MDH) and possibly expand it to other health facilities</li> <li>• Support the establishment of telemedicine systems/services for rehabilitation</li> <li>• Establish mobile prosthetic fitting services using immediate fit adjustable prosthesis (iFIT prostheses) for lower limbs, with rural populations as a special target</li> </ul>
<i>Capacity Strengthening in Botswana</i>	<ul style="list-style-type: none"> <li>• Continue to support RPRL at SKMTH in Gaborone and MDH as well as other health facilities with technical advice, training/recruitment of personnel, and technology procurement/maintenance</li> <li>• Revise curricula and foster inter-professional training in rehabilitation for UB computer science students, UB engineering students, UB medical students, UB social science students, and other trainees as needed</li> <li>• Continue to support the completion by Botswana investigators of a master of science in clinical epidemiology (MSCE) or an epidemiology certificate training (ECT) in trauma</li> <li>• Establish a team of prosthetists and prosthetist extenders who can manage patients with iFIT prostheses</li> <li>• Work with Botswana engineers at SKMTH and local laboratories to manufacture prosthetic components for iFIT prostheses</li> <li>• Work with the MOHW and Botswana insurance companies to establish coverage plans for patients in need of prostheses</li> </ul>
<i>Capacity Strengthening at Penn</i>	<ul style="list-style-type: none"> <li>• Enhance the engagement of Penn faculty and trainees across health disciplines and across sectors (including sectors outside of health such as engineering)</li> </ul>
<i>Knowledge Generation</i>	<ul style="list-style-type: none"> <li>• Pursue additional research projects based on needs/questions identified at point of care, guidance from partners, and funding availability</li> </ul>
<i>Strengthen the Partnership</i>	<ul style="list-style-type: none"> <li>• Coordinate with the UB Faculty of Medicine leadership, SKMTH leadership, MDH leadership, and other key stakeholders in Botswana (UB Computer Science Department leadership, UB Faculty of Engineering leadership, etc.) to monitor progress of the strategic plan, seek feedback on programmatic matters, and pursue programmatic and financial sustainability on ongoing activities and current projects</li> </ul>

## Detailed Objectives, Activities, and Timeline

### Health Service Delivery

#### YEARS 1-3 (JULY 2022 – JUNE 2025):

- BUP (led by Dr Michelle Johnson, Associate Professor of Physical Medicine and Rehabilitation and Director of the Rehabilitation Robotics Laboratory at Penn), the UB Faculty of Medicine (led by Dr Maikuto Kebaetswe, Senior Lecturer in the Biomedical Sciences Department), and the International Core of the Center for AIDS Research (CFAR) at Penn will continue to support health service delivery at the Rehabilitation, Prosthetics, and Robotics Laboratory (RPRL) at Sir Ketumile Masire Teaching Hospital (SKMTH) in Gaborone. The RPRL includes a cognitive laboratory, motor laboratory; and robotics laboratory. The clinical services available will include:
  - Rehabilitation assessment and therapy support for adult populations with neurocognitive pathologies such as Alzheimer disease, HIV, cerebrovascular accidents, traumatic brain injury, etc.
  - Rehabilitation assessment and therapy support for amputees and adult populations with peripheral neuromotor pathologies.
- BUP will continue to support of health service delivery in the Mahalapye District Hospital (MDH).
- BUP will seek to expand support of health service delivery through the establishment of telemedicine systems/services for rehabilitation.
- BUP will seek to establish mobile prosthetic fitting services using immediate fit adjustable prosthesis (iFIT prostheses) for lower limbs.
  - These services will augment those available in local clinics and provide prostheses for hard to reach populations, especially in rural areas. It is expected that as a result, there will be a significant reduction in the high wait times (over a year) that Botswana patients must endure to receive a prosthesis.
  - The iFIT prosthesis will have cosmetic covers and a smaller size to better accommodate the esthetic and clothing preferences of Botswana patients.

#### YEARS 3-5 (JULY 2025 – JUNE 2027):

- If additional funding becomes available, BUP will seek to expand its support of health service delivery to additional clinical services and other health facilities. Additional clinical services available would include:
  - Rehabilitation assessment and therapy support for pediatric populations with neurocognitive and peripheral neuromotor pathologies.

### Capacity Strengthening in Botswana

#### YEARS 1-3 (JULY 2022 – JUNE 2025):

- BUP will continue to support RPRL at SKMTH in Gaborone and MDH with technical advice, which will include:
- Cognitive assessment tools/guidelines such as color trail test, digital symbol coding, HIV dementia screening, MOCA test, verbal fluency test for animals, etc.
- Motor assessment tools/guidelines such as ADL scales, Fugl-Meyer test, grip strength dynamometry, grooved peg board test, ten meter walk, timed up and go test, etc.

- BUP will continue to support RPRL at SKMTH in Gaborone and MDH as well as other health facilities with training/recruitment of personnel through:
- Training of least 10 allied health professionals on how to utilize neurocognitive and neuromotor assessment tools/guidelines and technology
- Training of least 10 allied health professionals trained on how to fit prosthetic equipment.
- Development and implementation of workshops on rehabilitation design for hospital engineers.
- Provision of a training and mentoring platform at RPRL to two UB computer science students, two UB engineering students, two UB medical students, and two UB social sciences per year.
- BUP will continue to support RPRL at SKMTH in Gaborone and MDH with technology procurement/maintenance, which will include:
  - Rehab Community-based Affordable Robot Exercise System (Rehab C.A.R.E.S), consisting of two robots, a gait platform, as well as computer and monitors (for patients with cerebrovascular accidents).
  - Equipment for testing gross and fine hand function (for neuromotor pathologies).
  - Upper limb theradrive robots.
  - Prosthetic “low-tech” “low-cost” prosthetic equipment (iFIT transfemoral and transfibial kits) developed by Prof. Timothy Dillingham (Chair of Physical Medicine and Rehabilitation Department at Penn).
- Telemedicine systems/services for rehabilitation (including mobile/tablet-based platforms/tools).
- Electronic databases for rehabilitation patients integrated with MOHW electronic medical records.
- BUP will establish a team of prosthetists and their prosthetist extenders who can provide the iFIT prostheses through the newly established mobile fitting services and manage patients with lower limb loss.
- BUP will work with Batswana engineers at the SKMTH and local laboratories to manufacture prosthetic components that are compatible with iFIT sockets. These components include prosthetic feet, pylons, and prosthetic knees that withstand dust, water, and are highly functional for Batswana patients. The manufacturing process will utilize locally sourced materials and provide a platform for local job creation and employment.
- Lastly, BUP will work with the MOHW and Batswana insurance companies (including motor vehicle funds) to establish coverage plans for patients in need of prostheses.
- If the current transition in leadership allows it, BUP will pursue the renewal of the D43 international research training grant allowing approximately eight Batswana investigators per year to graduate from a master of science in clinical epidemiology (MSCE) in trauma from Penn or an epidemiology certificate training (ECT) in trauma from Botswana. This effort has been led by Prof. Douglas Wiebe (Professor of Epidemiology at PSOM), who will no longer be working at Penn. A new faculty lead needs to be identified in order to continue the current activities.

#### YEARS 3-5 (JULY 2024 – JUNE 2027):

If additional funding becomes available, BUP would seek to expand its support of RPRL at SKMTH in Gaborone and MDH as well as other health facilities to include additional technical advice, training/recruitment of personnel, and technology procurement/maintenance

- Other health facilities are yet to be determined.
- The ultimate goal of BUP (beyond the duration of the strategic plan) would be to work with the UB Faculty of Medicine leadership and the SKMTH leadership to help RPRL grow/evolve into a state of the art multi-disciplinary technology-assisted rehabilitation center for Botswana.
- Additional training/recruitment of personnel of personnel would include:
- Establishment of a multi-disciplinary rehabilitation certificate training credentialed by the Botswana Health Professional Council (BHPC).
- Recruitment of additional personnel at RPRL across multiple disciplines such as computer science, engineering, orthopedics, physical therapy, psychology, etc.
- Incorporation of a rehabilitation module in the curricula for UB computer science students, UB engineering students, UB medical students, UB social sciences (and possibly UB Master in Medicine (MMed students) in Family Medicine and Public Health and Internal Medicine).
- Additional technical advice and technology procurement/maintenance would include assessment tools/guidelines and equipment to provide rehabilitation assessment and therapy support for pediatric populations with neurocognitive and peripheral neuromotor pathologies.

#### Capacity Strengthening at Penn

##### YEARS 1-3 (JULY 2022 – JUNE 2025):

- BUP will seek to expand the engagement of Penn faculty and trainees in Botswana. Among the trainees, BUP will seek to provide a training and mentoring platform at RPRL to Penn engineering students (one per year), Penn medical students (one per year), Penn internal medicine residents (one per year), Penn physical medicine and rehabilitation residents (one per year). These trainees will gain exposure to global health, which might inform future academic endeavors.

#### Knowledge Generation

##### YEARS 1-3 (JULY 2022 – JUNE 2025):

- BUP will continue to pursue current research projects, which include:
- CFAR HIV and Stroke Pilot Study to provide robot-assisted rehabilitation assessment and therapy support to patients with cerebrovascular accidents, HIV, or both.
- Tech Development Pilot Project to help procure/maintain technology for rehabilitation in Botswana.
- Prosthetic Research and Development Pilot Project for Amputees to help design, manufacture, and utilize “low-tech” “low-cost” prosthetic equipment in Botswana
- The projected scientific output will be at least one article per project.
- If additional funding becomes available, other areas of inquiry to pursue will include:
- Assessment and therapy support of patients with HIV and cerebrovascular accidents through the development/utilization of a gait station and a lower limb robot station.

- Assessment of therapy support of patients with HIV-associated Neurocognitive Disorder (HANDS) development/utilization of a tablet-based assessment tool and a computer-based therapy tool.
- Additional areas of inquiry pursued by BUP will be informed by the challenges encountered and the lessons learned by BUP-affiliated faculty and trainees as well as the availability of funding.
- BUP will seek to develop a website/online dissemination portal and increase its social media presence.
- BUP will also collaborate with U.S. professional associations (AAN, AAP, ASME, IEEE, and ISPR) to increase awareness of its projects and activities in Botswana.

### Strengthen the Partnership

YEARS 1-3 (JULY 2022 – JUNE 2025):

- BUP will continue to coordinate with the UB Faculty of Medicine leadership, SKTMH leadership, MDH leadership, and other key stakeholders in Botswana (UB Computer Science Department leadership, UB Faculty of Engineering leadership, etc.) to monitor progress of the strategic plan, seek feedback on programmatic matters, and pursue programmatic and financial sustainability on ongoing activities and current projects.
- At a later stage, BUP will seek to expand the number of partners in Botswana to include other health facilities, other research institutions, and civil society organizations.
- BUP will also continue to fundraise by pursuing: (a) CDC implementation grants; (b) multi-lateral funding (available through UNICEF); (c) NIH- and FIC-sponsored D43, K43, and R21 awards; and (d) philanthropic funding.

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