****

Table of Contents

[A. Preface – Charge from Vice Chancellor for Research 1](#_Toc101861163)

[A.1. Background 1](#_Toc101861164)

[A.2. Charge 1](#_Toc101861165)

[B. Guiding Principles 2](#_Toc101861166)

[C. Defining Human Health and Wellness 3](#_Toc101861167)

[D. Defining Translational Research 3](#_Toc101861168)

[E. Approach to Landscape Assessment 5](#_Toc101861169)

[E.1. Academic Programming and Faculty 5](#_Toc101861170)

[E.2. External Awards 5](#_Toc101861171)

[E.3. Department or College By-laws 5](#_Toc101861172)

[E.4. Infrastructure 7](#_Toc101861173)

[E.5. Partnerships 7](#_Toc101861174)

[F. Findings of Landscape Assessment 7](#_Toc101861175)

[F.1. Limitations of the Data included in the Landscape Assessment 7](#_Toc101861176)

[F.2. Academic Programming and Faculty 8](#_Toc101861177)

[F.3. External Awards 11](#_Toc101861178)

[F.4. Department or College By-laws 12](#_Toc101861179)

[F.5. Infrastructure 13](#_Toc101861180)

[F.6. Partnerships 13](#_Toc101861181)

[G. Identified Strengths, Opportunities, Aspirations, Results 15](#_Toc101861182)

[H. Identified Goals and Strategies 17](#_Toc101861183)

[H.1. Goals, Objectives, and Strategies 17](#_Toc101861184)

[H.2. Recommended Implementation and Governing Structure for Goals and Strategies 20](#_Toc101861185)

[H.3. Anticipated Outcomes 20](#_Toc101861186)

[G. Campus Engagement 20](#_Toc101861187)

[References 22](#_Toc101861188)

[Appendix A: Members of Human Health and Wellness Working Group 23](#_Toc101861189)

[Appendix B: Human Health and Wellness Keywords 25](#_Toc101861190)

[Appendix C: Human Health and Wellness Degrees Awarded During Academic Years 26](#_Toc101861191)

[2020-2021, 2019-2020, and 2018-2019\* 26](#_Toc101861192)

**Human Health and Wellness Working Group**

## A. Preface – Charge from Vice Chancellor for Research

### A.1. Background

In 2020, the University of Tennessee (UT) launched its One Health Initiative, a research initiative designed to protect and promote the health of all life on Earth – including at the intersections of plant, animal, human and environmental health.  A key component in this initiative, which engages faculty, postdoctoral fellows and students across all UT colleges, is the elevation and growth of research and education programs undertaken to advance ***human health and wellness (HHW)***. For the 2020 NSF HERD survey, UT (University of Tennessee Knoxville [UTK] + University of Tennessee Institute of Agriculture [UTIA]) reported HHW research expenditures totaling ~$18.5 million. In the same year, more than 7,000 students enrolled in education programs that prepare future generations of professionals to support and advance HHW, including nurses, social workers, behavioral scientists, biochemists, microbiologists, psychologists, public health professionals, biomedical engineers, mechanical engineers, computer scientists, health analysts, nutritionists, and many others.  Over the next 10 years and as a strategic component in its One Health Initiative, the university seeks to significantly enhance its research and innovation portfolio in HHW through investments in faculty talent, research infrastructure and strategic partnerships, and to strengthen and/or grow related education programs at all levels.

### A.2. Charge

In November 2021, The Vice Chancellor for Research, Dr. Deborah Crawford, charged a HHW working group with creating a Strategic Plan (“plan”) that included a landscape assessment; a strengths, opportunities, aspirations, and results analysis; and goals and strategies.

*A.2.i. Landscape Assessment*

The group was asked to develop inventories and analyses of:

* faculty currently supporting our research and education programs in HHW;
* related education programs at all levels;
* active research projects, both externally- and internally-funded, and supporting fundamental, clinical, translational and community-engaged research;
* existing research and education infrastructure, including places, facilities and tools; and,
* partnerships with external organizations, including industry, and the promise such partnerships create.

The working group was composed of 31 faculty and administrators from UTK and UTIA (see Appendix A). The co-Chairs of the working group were Hollie Raynor, Associate Dean of Research for the College of Education, Health, and Human Sciences, and Brad Day, Associate Vice Chancellor for Research & Innovation Initiatives.

*A.2.ii. Strengths, Opportunities, Aspirations and Results*

Based on the inventories and analyses developed through the landscape assessment, the working group was tasked with identifying the strengths, opportunities, aspirations and results that should be considered and sought in UT’s current research and education portfolio to advance HHW. The strategies identified in the “goals and strategies” section of the plan should leverage the strengths and opportunities described in this section, and describe our aspirations and desired results.

**Figure 1. UTK & UTIA Units in Human Health and Wellness**

*A.2.iii. Goals and Strategies*

The working group was also charged with developing goals and strategies to increase UT’s status as a university leader in HHW research and education. The working group was encouraged to develop goals and strategies for the broad categories of “people,” “programs,” “infrastructure,” and “partnerships.” Finally, a stronger and more strategic partnership with the UT Health Sciences Center was considered to be highly desirable.

## B. Guiding Principles

* Elevate and grow scholarship and education programs undertaken to advance HHW
* Strengthen faculty talent, research infrastructure, and strategic partnerships to enhance UT’s research and innovation portfolio in HHW
* Align education programming to address anticipated workforce development needs for applied and research fields in HHW
* Create a strong, coherent translational research identity that strengthens interdisciplinary collaboration via team science philosophy

## C. Defining Human Health and Wellness

**Figure 1** illustrates the departments and colleges on the UTK and UTIA campuses that have a main focus of engaging in research and education programming in HHW. As illustrated, we have identified three broad science areas, biomedical, human, and natural environmental science, that are poised to lead UT’s effort to protect and promote HHW. Within this figure, biomedical science includes the life sciences, physiological sciences, physical sciences, and engineering.1 Human science incorporates the concepts of wellness framed by the Substance Abuse and Mental Health Services Administration, and includes dimensions of educational, physical, and social wellness.2 Thus, within the human science area, three sub-areas were identified: education, physical, and social. The broad area of natural environmental science, which includes animal, plant, and environmental health, not only acknowledges UT’s One Health Initiative, but helps show the relationship between this area and biomedical and human science, and how connections can be made across UTK and UTIA. Included departments and colleges in the figure were mapped onto the identified science area based upon departmental or college disciplinary expertise, as determined by the committee and the leaders of the departments and colleges. Along with the identified departments and colleges in Figure 1, there are additional departments and colleges that may collaborate in educational and research thrusts within HHW, including those departments that provide expertise in the built environment (e.g., School of Architecture, Civil and Environmental Engineering) and communications (e.g., School of Communication Studies, School of Advertising and Public Relations). However this additional units are not included in the landscape assessment.

Within the units shown in Figure 1, educational and research endeavors may be implemented in different levels of a biological system. **Figure 2**, which highlights the identified science areas in the center, describes the levels, molecular/cellular, plant/animal/individual, forest/herd/community, and policy, that are commonly implemented within the biological system of the science areas that are within the center circle of the figure.

## D. Defining Translational Research

The National Institutes of Health (NIH) developed a translational science spectrum for human health, focused on more traditional biomedical research that spans the social, behavioral, and biological basis of health and disease to interventions that improve public health.3,4 Additionally, NIH has a translational science spectrum for environmental health science, beginning with fundamental research questions and concluding with impact on practice, guidelines, or policies.5 The spectrum is not designed as a linear or unidirectional spectrum, but rather as stages that build upon and inform each other. The stages for biomedical research and environmental health science are shown in the outer ring of **Figure 2**.

For traditional biomedical research, a common nomenclature used to describe the translational stages is basic, preclinical, clinical, clinical implementation, and public health research.3 Basic research involves science that identifies fundamental mechanisms of biology, disease, or behavior. Preclinical research connects to basic research by developing interventions to better understand a disease and identify ways to treat the disease. Preclinical research uses cell or animal models of disease; samples of human or animal tissues; or computer-assisted simulations of drug, device, or diagnostic interactions within living systems. Clinical research involves humans, and includes studies to better understand disease in humans, while relating these findings to animal or cell models. Clinical research also tests/refines new technologies in humans; evaluates intervention safety and efficacy; and includes behavioral and observational studies, and patient outcome and health services research. Clinical implementation research focuses on dissemination and implementation of research-based interventions into routine care in practice-based and community-based settings. Finally, public health research examines the effects of disease on population health, as well as differing types of efforts used to prevent, diagnose, and treat disease at the population level.

For environmental health research, a common nomenclature used to describe the translational stages is fundamental questions, application and synthesis, implementation and adjustment, practice, and impact research.5 Fundamental questions focus on biological processes and pathways and systems that are influenced by environmental stressors. In application and synthesis research, experiments are conducted in controlled settings to gain a greater understanding of a process or effect. Research activities include developing new methods, approaches, and tools (e.g., exposure sensors). The implementation and adjustment research stage applies experiments in real-world settings and adjusts the product (intervention, tool, method, treatment, etc.) to assist with generalization (i.e., different settings and populations). The practice stage is research that targets moving established evidence into practice. This includes using evidence to inform new guidelines in the areas of prevention, diagnosis, or treatment of exposure, illness, and disease. Finally, the impact stage of translational research evaluates the environmental, clinical, or public health impact of a practice, guideline, or policy.

While the biomedical and environmental health science translational spectrums use different nomenclature, the characteristics of each stage are similar. Research methodology varies across the translational science spectrum, but is fairly consistent within each stage. Establishing strengths across the stages of the translational spectrum at UT will assist with having expertise that can be used to strengthen research project design so that project outcomes are better positioned to be translated into future projects within the translational science spectrum. Enhancing UT’s translational expertise within faculty will strengthen educational training, allowing education programs to extend beyond discipline specific content. Finally, strengthening faculty translational expertise across the spectrum, and developing cohesive translational expertise in specified HHW areas, should assist with acquiring center-type grants, particularly from NIH.

## E. Approach to Landscape Assessment

Data for the landscape assessment were collected in five main areas: academic programming and faculty, external awards, department or college by-laws guidelines regarding team science, infrastructure, and external partners. The methodology used for each type of data are described below.

### E.1. Academic Programming and Faculty

The 2021-2022 Online Undergraduate and Graduate Catalogs were used to identify all major degrees and minors offered by the 25 departments and colleges that fell within the areas of HHW identified in Figure 1. A subcommittee of seven members of the working group coded each major degree and minor into the translational stages(s) (the coding could range from one to all five stages) it represented, based upon the provided catalog description. The number of full-time tenure-track and full-time non-tenure-track faculty for Fall 2020 for each of the departments and colleges was obtained from Office of Institutional Research and Assessment (OIRA). Data from OIRA were also used to determine the number of awarded bachelor, master, and doctoral degrees for each of the coded major degrees in which there were data for academic years 2020-2021, 2019-2020, and/or 2018-2019.

### E.2. External Awards

For the landscape assessment, external funding awards at UTK and UTIA related to HHW were identified in Cayuse SP. For this identification process, a list of 277 HHW keywords (see **Appendix B**) was developed by the working group. Titles and abstracts of awards within Cayuse SP were searched, and those that contained at least one keyword and occurred within FY2019, FY2020, and FY2021 in which the lead investigator was based in one of the 25 departments and colleges identified in Figure 1 were considered to be awards that should be included in the assessment. This identification process was completed by Anna Banks, the Director of Research Informatics in the Office of Research, Innovation, and Economic Development (ORIED). The identified awards were then coded into the translational stage(s) (the coding could range from one to five stage) it represented, based upon the title and the abstract. A subcommittee of 13 members from the working group completed this coding.

### E.3. Department or College By-laws

Addressing the large and complex HHW research challenges that occur today requires expertise across multiple disciplines, as well as methodological proficiency in translational research, that spans basic research to public health solutions (benchtop to policy).6,7 Thus, addressing these research problems requires a “multiple disciplinary”8 (includes multi-, inter- and transdisciplinary), team science approach. Team science research may engage internal (units, departments, colleges, institutes in the same institution) and external (other institutions, government agencies, non-governmental organizations, foundations, industry) entities.6 Promotion and tenure guidelines often have limited flexibility for the recognition of effort by scholars involved in team science programs as it relates to success in extramural funding; performance of research; mentoring of students and faculty; and scholarly outcomes including publications, presentations, and published abstracts.6,7 These guidelines can be heavily weighted towards individual achievement (i.e., principal investigators (PIs), primary authors, mentoring author, corresponding author, presenter, etc.). Such perceptions often lead to confusion and/or conflict with faculty in the promotion and tenure process if they are encouraged to engage in team science but do not receive appropriate credit for those activities.6,7

To determine if department or college by-laws supported team science, the by-laws of the 25 departments and college in Figure 1 were reviewed. The by-laws were reviewed for the following recommended areas that are considered to support team science: 6,7,9

1. Express value for team science and encourage participation. This would include, but not be limited to, describing what team science is, and stating that independent and team science research contributions are valued equally.
2. Provide a rubric describing how achievements in team science should be documented in teaching, research, and service. For example, multiple faculty in different disciplines working on independent segments of a project should be recognized as the lead, primary, or mentoring faculty for their contributions and efforts in the designated portion of the work. If there are multiple faculty working together within the same discipline, then the lead faculty for those contributions should be identified at the onset of the project so that credit can be assigned and recognized as to the lead, primary, or mentoring faculty versus a role as a collaborating faculty.
3. Evaluate team science consistently across faculty tracks. If guidelines express support for different faculty track roles (i.e., tenure-track faculty are encouraged to have independent contributions, while non-tenure-track faculty are encouraged to have collaborative or support roles), this demonstrates inconsistency in the value of team science across faculty tracks.
4. Appraise team science consistently across faculty rank. If guidelines encourage team science in early career ranks and independent contributions in mid- or senior career ranks, or *vice versa*, this demonstrates inconsistency in the value of team science across faculty rank.
5. Value team science consistently across the institution. If the role of team science has equal value to independent contributions to research in some units, while independent contributions have a higher value than team science research contributions in other units, this demonstrates inconsistency in the value of team science across the institution.
6. Offer guidance for multiple disciplinary work, where faculty have joint appointments, for the development of memoranda of understanding (MOU). The MOU should establish the division of responsibilities and expectations for promotion and/or tenure of the faculty member with the joint appointment. This MOU is then available to all individuals engaging in the evaluation process.
7. Provide recommendations that for multiple disciplinary work, dissemination outlets (i.e., journals) are of equal value, regardless if they are discipline-specific or multiple disciplinary. If guidelines express support for faculty to disseminate in specific disciplinary outlets first (or that these outlets hold greater value), this demonstrates inconsistency in valuing multiple disciplinary work.
8. Recognize the value of (grant) awards for faculty participating in team science activities. Faculty leads who are sub-awards to another entity (campus, institution, federal agency, etc.) and whose work is essential and independent from the work of the primary entity(ies), should be considered equal to the reverse of roles (e.g., UTK as primary and another institution as sub-award).
9. Acknowledge faculty service on graduate committees at other institutions in a similar manner to committee membership in the home department or institution.

A checklist of the above recommendations was created by a subcommittee of eight working group members which reviewed the bylaws for each recommendation, noting if the recommendation was present, absent, or inconsistent.

### E.4. Infrastructure

Requests were made to associate deans of research in the colleges that were part of the assessment and ORIED for documentation of space and equipment to engage in HHW research.

### E.5. Partnerships

For the landscape assessment, memorandums of understanding (MOUs) and agreements at UTK and UTIA related to HHW were identified in Cayuse SP to identify partners. For this identification process, a list of 277 HHW keywords was developed by the working group. Titles and abstracts of MOUs and agreements within Cayuse SP were searched, and those that contained at least one keyword and occurred within FY2019, FY2020, and FY2021 in which the lead investigator was based in one of the 25 departments and colleges identified in Figure 1 were considered to be awards that should be included in the assessment. This identification process was completed by Anna Banks. Another source of partnerships documented by the Institutional Review Board was from Jennifer Engle, Director of the Human Research Protection Program. Finally, at the suggestion of department heads and deans from the units in Figure 1, the associate deans in the colleges that have units in Figure 1 in the areas of academics, engagement, and/or research were asked for college partnerships.

## F. Findings of Landscape Assessment

### F.1. Limitations of the Data included in the Landscape Assessment

While the findings of the landscape assessment are based upon collected data, there are methodological limitations within the landscape assessment that are important to recognize. First, collected data are limited to the 25 identified units in Figure 1. As acknowledged in section C, there are additional departments and colleges that may collaborate in educational and research thrusts within HHW, but this assessment only includes data from the 25 identified units. Also, translational stages were hand-coded by committee members based upon limited written descriptions, and interrater reliability of the coding was not determined. Thus, the consistency of the coding across the committee members is not known. A similar consistency coding issue occurs with the departmental bylaws, as interrater reliability of the coding of the bylaws was not determined. Finally, as there was no main centralized resource for infrastructure and partnership data, the methods used to collect these data may hamper the ability for these data to completely capture information in these areas.

### F.2. Academic Programming and Faculty

The data on the academic programs and faculty are shown in **Table 1**. A total of 230 nonduplicate major degrees and minors, resulting in 255 major degrees and minors that were categorized into the science areas (some major degrees and minors fell into more than one science area) were identified. Some major degrees and programs from the departments and colleges in Figure 1 were not included as they were not deemed to pertain to HHW (i.e., aerospace engineering). The largest number of majors degrees and minors were in natural environmental science (n = 94), while human science education had the smallest number (n = 32). The biomedical, human social, and natural environmental science areas generally had the greatest proportion of their major degrees and minors at the bachelor level, while human science education and human science physical had the greatest proportion of their major degrees and minors at the master level. All sciences areas, except human science physical, had approximately 25% of their academic programs at the doctoral level. Human science physical had less than 20% of their academic programs at the doctoral level.

For translation, two science areas that had major degrees and minors in all five translation stages was natural environmental science and human science physical. Natural environmental science had a better balanced proportion of major degrees and minors across the translational stages, as compared to human science physical. Natural environmental science had fewer academic programs in the later translational stages, while human science physical had fewer academic programs in the earlier translational stages. Biomedical science academic programs were in the first three stages of translation, while academic programs in human science education were in the later three stages of translation. Human science social academic programs were in four stages of translation. Biomedical and natural environmental science both had greater than 30% of their academic programs that were categorized as having multiple translational phases. A few multidisciplinary or interdisciplinary academic programs were found. Comparative and Experimental Medicine, which is an intercollegiate program, prepares students from a multidisciplinary, translational perspective. This program is predominantly based in the biomedical science area providing both master and doctoral level degrees. The One Health minor, an undergraduate and graduate program, is an interdisciplinary program focused in agricultural, environmental, and human sciences.

For faculty, biomedical science had the greatest number of faculty, with 186 full-time tenure-track faculty and 78 full-time non-tenure-track faculty. Human science education had the least number of faculty, with 54 full-time tenure-track faculty and 37 full-time non-tenure-track faculty. All areas, except the human science physical area, had more full-time tenure-track faculty than full-time non-tenure-track faculty. The ratio of full-time tenure-track to non-tenure-track faculty ration was greatest for natural environmental science (11.3 to 1), while human science physical area had the smallest ratio (0.9 to 1). The lower ratio in human science physical was predominantly driven by the high number of full-time non-tenure-track faculty in Nursing.

|  |
| --- |
| **Table 1. Human Health and Wellness Academic Programs Academic Year 2021-2022\*** |
|  | **BS** | **HS-E** | **HS-P** | **HS-S** | **NES** | **TOTAL** |
| Programs, n | 33 | 32 | 43 | 53 | 94 | 255 |
| Programs in each translational phase, n (% of all programs in a science area) Basic/Fundamental Preclinical/Application & Synthesis Clinical/Implementation & Adjustment Clinical Implementation/Practice Public Health/Impact  | 19 (57.6)18 (54.5)7 (21.2)0 (0.0)0 (0.0) | 0 (0.0)0 (0.0)19 (59.4)8 (25)6 (18.8) | 1 (2.3)1 (2.3)24 (55.8)10 (23.3)17 (39.5) | 0 (0.0)3 (5.7)15 (28.3)11 (20.8)29 (54.7) | 22 (23.4)25 (26.6)51 (54.3)23 (24.4)7 (7.4) | 42 (16.5)47 (18.4)116 (45.5)52 (20.4)59 (23.1) |
| Programs with multiple translational phases, n (% of all programs in a sciencearea) | 14 (42.2) | 1 (3.1) | 8 (18.6) | 8 (15.1) | 31 (33.0) | 61 (23.9)  |
| Bachelor programs, n (% of all programs in a science area) | 15 (45.5) | 7 (21.9) | 11 (25.6) | 22 (41.5) | 46 (48.9)  | 101 (39.6) |
| Bachelor programs in each translational phase, n (% of all bachelor programs in a science area) Basic/Fundamental Preclinical/Application & Synthesis Clinical/Implementation & Adjustment Clinical Implementation/Practice Public Health/Impact | 6 (40.0)5 (33.3)5 (33.3)0 (0.0)0 (0.0) | 0 (0.0)0 (0.0)7 (100.0)0 (0.0)0 (0.0) | 1 (9.1)1 (9.1)8 (72.7)1 (9.1)3 (27.3) | 0 (0.0)0 (0.0)5 (22.7)5 (22.7)13 (59.1) | 4 (8.7)3 (6.5)30 (65.2)17 (37.0)7 (15.2) | 11 (10.9)9 (8.9)55 (54.5)23 (22.8)23 (22.8) |
| Bachelor programs with multiple translational phases, n (% of all bachelor programs in a science area) | 3 (9.1) | 0 (0.0) | 2 (18.2) | 4 (18.2) | 14 (30.4) | 23 (22.8) |
| Master programs, n (% of all programs in a science area) | 10 (30.3) | 17 (53.1) | 24 (55.8) | 17 (32.1) | 25 (26.6) | 93 (36.5) |
| Master programs in each translational phase, n (% of all master programs in a science area) Basic/Fundamental Preclinical/Application & Synthesis Clinical/Implementation & Adjustment Clinical Implementation/Practice Public Health/Impact | 7 (70.0)7 (70.0)1 (10.0)0 (0.0)0 (0.0) | 0 (0.0)0 (0.0)9 (52.9)5 (29.4)4 (23.5) | 0 (0.0)0 (0.0)12 (50.0)7 (29.2)10 (41.7) | 0 (0.0)2 (11.8)5 (29.4)3 (17.6)8 (47.1) | 9 (36.0)10 (40.0)11 (44.0)4 (16.0)0 (0.0) | 16 (17.2)19 (20.4)38 (40.1)19 (20.4)22 (23.7) |
| Master programs with multiple translational phases, n (% of all master programs in a science area) | 6 (60.0) | 1 (14.3) | 4 (16.7) | 1 (5.9) | 7 (28.0) | 19 (20.4) |
| Doctoral programs, n (% of all programs in a science area) | 8 (24.2) | 8 (25.0) | 8 (18.6) | 14 (26.4) | 23 (24.5) | 61 (23.9) |
| Doctoral programs in each translational phase, n (% of all doctoral programs in a science area) Basic/Fundamental Preclinical/Application & Synthesis Clinical/Implementation & Adjustment Clinical Implementation/Practice Public Health/Impact | 6 (75.0)6 (75.0)1 (12.5)0 (0.0)0 (0.0) | 0 (0.0)0 (0.0)3 (37.5)3 (37.5)2 (25.0) | 0 (0.0)0 (0.0)4 (50.0)2 (25.0)4 (50.0) | 0 (0.0)1 (7.1)5 (35.7)3 (21.4)8 (57.1) | 9 (39.1)12 (52.2)10 (43.5)2 (8.7)0 (0.0) | 15 (24.6)19 (31.1)23 (37.7)10 (16.4)14 (23.0) |
| Doctoral programs with multiple translational phases, n (% of all doctoral programs in a science area) | 5 (62.5) | 0 (0.0) | 2 (25.0) | 3 (21.4) | 10 (43.5) | 20 (32.8) |
| Full-time, tenure-track faculty in departmental or college units (Fall 2020), n | 186 | 54 | 66 | 124 | 181 | 461 |
| Full-time, non-tenure-track faculty in departmental or college units (Fall 2020), n | 78 | 37 | 74 | 44 | 16 | 249 |
| \*Programs include majors and minors and programs may be included in more than one science and translational area. BS = Biomedical science; HS-E = Human science – education; HS-P = Human science – physical; HS-S = Human science – social; NES = Natural environmental science. |

|  |
| --- |
| **Table 2. Human Health and Wellness Degrees Awarded During Academic Years 2020-2021, 2019-2020, and 2018-2019\***  |
|  | **2020-2021** | **2019-2020** | **2018-2019** |
| All degrees, n BS HS-E HS-P HS-S NES | 457186786846641 | 500225830857614 | 427183761789642 |
| \*Awards may be included in more than one science and translational area. BS = Biomedical science; HS-E = Human science – education; HS-P = Human science – physical; HS-S = Human science – social; NES = Natural environmental science. |

For awarded degrees, the largest number of degrees was in human science social, followed by human science

|  |
| --- |
| **Table 3. Human Health and Wellness Degrees Awarded During Academic Years 2020-2021, 2019-2020, and 2018-2019 in Areas of Translation\*** |
|  | **2020-2021** | **2019-2020** | **2018-2019** |
| Degrees from programs in Basic/Fundamental phase, n (% of degrees in a science area) BS HS-E HS-P HS-S NES | 252 (55.1)0 (0.0)0 (0.0)0 (0.0)125 (19.5) | 250 (50.0)0 (0.0)0 (0.0)0 (0.0)207 (33.7) | 220 (51.5)0 (0.0)0 (0.0)0 (0.0)180 (28.0) |
| Degrees from programs in Preclinical/Application & Synthesis phase, n (% of degrees in a science area) BS HS-E HS-P HS-S NES | 70 (15.3)0 (0.0)0 (0.0)13 (1.5)56 (8.7) | 127 (25.4)0 (0.0)0 (0.0)69 (8.1)54 (8.8) | 78 (18.3)0 (0.0)0 (0.0)10 (1.3)64 (10.0) |
| Degrees from programs in Clinical/Implementation & Adjustment phase, n (% of degrees in a science area) BS HS-E HS-P HS-S NES | 193 (42.2)148 (79.6)713 (90.7)411 (48.6)291 (45.4) | 181 (36.2)178 (79.1)770 (92.8)350 (40.8)361 (58.8) | 196 (45.9)148 (80.9)697 (91.6)362 (46.0)398 (62.0) |
| Degrees from programs in Clinical Implementation/Practice phase, n (% of degrees in a science area) BS HS-E HS-P HS-S NES | 0 (0.0)37 (19.9)140 (17.8)325 (38.4)88 (13.7) | 0 (0.0)40 (22.5)140 (16.9)332 (38.7)83 (13.5) | 0 (0.0)28 (15.3)127 (16.7)297 (37.7)110 (17.1) |
| Degrees from programs in Public Health/Impact phase, n (% of degrees in a science area) BS HS-E HS-P HS-S NES | 0 (0.0)1 (1.0)32 (4.1)115 (13.6)22 (3.4) | 0 (0.0)7 (3.9)28 (3.4)116 (13.5)16 (2.6) | 0 (0.0)7 (3.8)32 (4.2)142 (18.0)30 (4.7) |
| Degrees with multiple translational phases, n (% of degrees in a science area) BS HS-E HS-P HS-S NES | 58 (12.7)0 (0.0)99 (12.6)15 (1.8)110 (17.2) | 5 (1.0)0 (0.0)108 (13.0)14 (1.6)99 (16.1) | 69 (16.2)0 (0.0)95 (12.5)21 (2.7)130 (20.2) |
| \*Degrees may be included in more than one science and translational area. BS = Biomedical science; HS-E = Human science – education; HS-P = Human science – physical; HS-S = Human science – social; NES = Natural environmental science. |

 physical (see **Table 2**). These two areas account for almost half of all of the degrees awarded in the HHW area. Human science education had the fewest number of annual degrees. The degrees driving the high number in human science social and human science physical are (each degree has more than 150 awards per year): Kinesiology (Bachelor’s degree), Nursing (Bachelor’s degree), Psychology (Bachelor’s degree), and Social Work (Master’s degree). While all science areas have most of their degrees at the baccalaureatelevel, human science physical has the greatest proportion of their degrees at the baccalaureatelevel (approximately 80%), and the lowest proportion of their degrees at the doctoral level (less than 3%).

For translation (see **Table 3**), only natural environmental science

awarded degrees in all five stages of translation, with the smallest proportion of degrees in the last stage of translation. The degrees in biomedical science were in the first three stages of translation, while the degrees in human science education and human science physical were in the last three stages of translation. The human science social degrees covered four stages of translation. Biomedical science, human science physical, and natural environmental science had more than 10% of their degrees that were categorized as having multiple translational phases. See **Appendix C** for detailed data on awarded degrees.

### F.3. External Awards

|  |
| --- |
| **Table 4. Human Health and Wellness Awards within Each Translational Stage from FY2019-FY2021\*** |
|  | **Current****Awards (#)** | **Obligated Amount ($)** | **Lead Faculty (#)** |
| Basic/FundamentalPreclinical/Application & SynthesisClinical/Implementation & AdjustmentClinical Implementation/PracticePublic Health/Impact**Total**  | 29914111477103**734** | 63.24M28.46M14.47M14.92M27.50M**178.59M** | 172102855672**487** |
| \*Awards may be included in more than one translational area. |

Approximately 826 awards in the broad area of HHW at UT were identified. Again, these projects were cataloged based on the list of HHW keywords shown in **Appendix B**. Manual curation of this list resulted in a high-confidence list of 645 awards; the reduction in awards from the original 826 identified awards is the result of the elimination of non-HHW themes initially identified by keyword search. The 645 awards totaled $127.00M in obligated funds and were awarded to 287 faculty. The top funding agency in terms of number of awards and obligated funds was the United States Department of Agriculture (USDA), with 86 awards and $19.97M in obligated funds. While NIH only funded 36 awards, it provided the second largest source of obligated funds ($19.48M).

As shown in **Table 4**, classification of awards by translational stage resulted in 46% of the awards, which included 50% of the total obligated funds, being classified as “Basic/Fundamental.” This indicates a strong foundational focus in mechanistic-based HHW awards at UT. In comparison, “Clinical/Implementation & Adjustment,” and “Clinical Implementation/Practice,” awards were underrepresented at UT (18% and 12% of awards and 11% and 12% of total obligated funds, respectively).

|  |
| --- |
| **Table 5. Human Health and Wellness Awards from FY2019-FY2021 that Span Multiple NIH-defined Translational Research Stages.\*** |
|  | **Current****Awards (#)** | **Obligated Amount ($)** | **Lead Faculty (#)** |
| Basic→PreclinicalPreclinical→ClinicalClinical→Clinical ImplementationClinical Implementation→Public HealthMulti-stage Translation**Total** | 1518101911**73** | 3.96M3.34M1.53M3.02M3.70M**15.55M** | 14188169**65** |
| \*Awards may be included in more than one translational area. NIH = National Institutes of Health. |

As a next step in identifying the nature of awards in HHW at UT, awards that spanned the transition from one translational stage to the next (e.g., “Basic/Fundamental” to “Preclinical/Application & Synthesis”) were identified. As shown in **Table 5**, UT had 73 awards that spanned multiple stages of translation, including 11 (3.70M obligated funds) which captured multiple (>2) stages of translation. Of the awards that spanned two stages of translation, the “Clinical/Implementation & Adjustment” to “Clinical Implementation/Practice” transition was underrepresented at UT (10 awards, 1.53M obligated funds).

When examined by science area and translational stage, all science areas had > 3 awards in each translational stage. Natural environmental science had the greatest number of awards and obligated funds (see **Table 6**). While natural environmental science had representation of each translational stage in its awards, the bulk of the awards were in the “Basic/Fundamental” and “Preclinical/Application & Synthesis” stages. The two science areas with less than 100 awards were human science education and human science physical. Given these two science areas have the lowest number of full-time tenure-track faculty, the lower number of awards in these science areas is not unexpected. It is important to note that when academic programming and award data are combined, human science physical has a low number of awards, a low number of full-time tenure-track faculty, but a high number of degrees awarded.

|  |
| --- |
| **Table 6. Human Health and Wellness Awards** **from FY2019-FY2021 by Science Area and Translational Stage\*** |
|  | **BS** | **HS-E** | **HS-P** | **HS-S** | **NES** | **TOTAL** |
| Awards, n Basic/Fundamental Preclinical/Application & Synthesis Clinical/Implementation & Adjustment Clinical Implementation/Practice Public Health/Impact **Total** | 7338271119**168** | 84336**24** | 131016824**71** | 2919182922**117** | 24496712837**476** | 36716713579108**856** |
| Awards, Obligated $ Basic/Fundamental Preclinical/Application & Synthesis Clinical/Implementation & Adjustment Clinical Implementation/Practice Public Health/Impact **Total** | 29.08M7.38M3.77M2.94M4.79M**47.96M** | 0.50M2.06M0.19M0.66M1.25M**4.66M** | 3.02M7.31M3.09M1.30M6.89M**21.61M** | 3.21M6.73M2.39M7.22M11.30M**30.85M** | 56.50M16.53M9.66M3.75M3.04M**89.48M** | 92.31M40.01M19.1M15.87M27.27M**194.56M** |
| \*Awards may be included in more than one science and translational area. BS = Biomedical science; HS-E = Human science – education; HS-P = Human science – physical; HS-S = Human science – social; NES = Natural environmental science. |

### F.4. Department or College By-laws

Across the 25 departments and colleges included in the HHW analysis, the mean percent of team science recommendations that were met in by-laws was only 7.5% (range 0% to 50%). Fifteen of the assessed departments and colleges met none of the team science recommendations in their by-laws, while Sociology had the highest rating of meeting the recommendations (50%). The most commonly met recommendation, by eight departments and colleges, was having a statement about valuing team science and encouraging participation in team science in their by-laws. The mean percent of team science recommendations in by-laws met by science area is shown in **Figure 3**.

### F.5. Infrastructure

No inventory was identified that clearly documents lab space and equipment for academic or research endeavors. Documentation of infrastructure related to Core Facilities

*(https://research.utk.edu/oried/research-innovation-initiatives/core-facilities/)* and freezers was identified, and is based at ORIED. Other sources of information on infrastructure included data collected in March and April 2020 from individual researchers when UT anticipated a potential research laboratory closure due to the COVID-19 pandemic.

### F.6. Partnerships

For partnerships, 535 unique partners were identified, with the two most common partnerships being Knox County Schools (six different departments and colleges) and Cherokee Health Systems (five different departments and colleges). For academic endeavors, 428 unique partnerships were identified. There were three partners that engaged in academic endeavors with at least three different departments and colleges: Contact Care Line, East Tennessee Children’s Hospital, and Knox County Schools. For research endeavors, 105 unique partnerships were identified, with the University of Tennessee Medical Center partnering with four different departments and colleges. Twelve unique partnerships were identified in which both academic and research endeavors were occurring within the same department or college. See **Table 7** for a list of partners who engaged in both academic and research activities with at least one department or college.

|  |
| --- |
| **Table 7. UT Partners with Academic and Research Activities** |
| **College** | **Department/Unit** | **Partner** | **Activity** |
| EHHS | Public Health | Catholic Charities of East Tennessee | Research |
| Social Work |  | Catholic Charities of East Tennessee | Academic |
| EHHS | CFS | Centro Hispano | Academic/Research |
| Arts & Sciences | Psychology | Cherokee Health Systems | Academic |
| EHHS | Nutrition | Cherokee Health Systems | Academic/Research |
| EHHS | Public Health | Cherokee Health Systems | Research |
| Nursing |  | Cherokee Health Systems | Research |
| Social Work |  | Cherokee Health Systems | Academic |
| EHHS | Nutrition | Endocrinologist Consultants of East Tennessee | Academic |
| IRB |  | Endocrinologist Consultants of East Tennessee | Research |
| Nursing |  | Helen Ross McNabb | Research |
| Social Work |  | Helen Ross McNabb | Academic |
| EHHS | KRSS | Knox County Health Department | Research |
| EHHS | Nutrition | Knox County Health Department | Academic/Research |
| EHHS | Public Health | Knox County Health Department | Academic |
| EHHS | CFS | Knox County Schools | Research |
| EHHS | EPC | Knox County Schools | Academic |
| EHHS | Nutrition | Knox County Schools | Research |
| EHHS | TPTE | Knox County Schools | Academic/Research |
| Nursing |  | Knox County Schools | Academic |
| Social Work |  | Knox County Schools | Academic |
| EHHS | Nutrition | Knox County WIC | Academic/Research |
| EHHS | CFS | Knoxville Family Justice Center | Academic/Research |
| EHHS | CFS | Knoxville-Knox County Head Start | Academic/Research |
| IRB |  | Nashville Cares | Research |
| Social Work |  | Nashville Cares | Academic |
| Nursing |  | Remote Area Medical, Inc | Academic/Research |
| EHHS | Nutrition | Second Harvest Food Bank of East TN | Academic/Research |
| EHHS | CFS | SHADES of Development | Academic/Research |
| Agriculture | Food Science | Tennessee Department of Health | Research |
| EHHS | Public Health | Tennessee Department of Health | Academic/Research |
| Nursing |  | Tennessee Department of Health | Research |
| EHHS | CFS | Tennessee Department of Health  | Research |
| EHHS | Nutrition | United Way of Greater Knoxville | Academic/Research |
| EHHS | Public Health | University of Tennessee Medical Center | Research |
| Engineering | MABE | University of Tennessee Medical Center | Research |
| Nursing |  | University of Tennessee Medical Center | Research |
| Social Work |  | University of Tennessee Medical Center  | Academic |
| Engineering | MABE | Vanderbilt University Medical Center | Research |
| Nursing |  | Vanderbilt University Medical Center | Academic |
| Social Work |  | Vanderbilt University Medical Center | Academic |
| EHHS = College of Education, Health, and Human Sciences; CFS = Child and Family Studies; IRB = Institutional Review Board (no department or college associated with the partnership was provided); KRSS = Kinesiology, Recreation, and Sport Studies; EPC = Educational Psychology and Counseling; TPTE = Theory & Practice in Teacher Education; MABE = Mechanical, Aerospace and Biomedical Engineering. |

|  |
| --- |
| G. Identified Strengths, Opportunities, Aspirations, Results |
| **Strengths**UT’s connections with many community-based, external partners provides applied academic training and research collaborations in many areas of human health and wellness, specifically clinical/implementation and adjustment, and implementation/practice translational phases (e.g., relationship with Cherokee Health Systems).Natural environment science area has academic programming and research that spans the five areas of translation.Faculty disciplines, academic programing, and research across UTK and UTIA provide extensive coverage of human health and wellness in many areas (connection of natural environmental science to biomedical science or human science areas and across translational stages) that many other R1 institutions do not have. For example, a theme of food and nutrition security and health cuts across the majority of disciplines at UTK and UTIA and is a theme not commonly seen in R1 institution that are more medical-school focused, providing a One Health framework.Centers, such as NIMBioS (fosters the maturation of cross-disciplinary approaches in mathematical biology) and SWORPS (program evaluation to determine better outcomes for individuals, families, communities, and organizations) support human health and wellness academic programming and research activities.UT is located in Appalachia, which is a region in the US that experiences health disparities, in which UT can implement unique academic programming and research to address the disparities.Doctoral programs in human health and wellness span the five stages of translation Human science physical and human science social academic programming provides a large number of awarded degrees.Basic science research is well-funded at UTK and UTIA. Identification of areas of strength, or areas having the potential for leadership through a team science approach, could be elevated to national prominence. The College of Veterinary Medicine’s expertise in biomedical research using translational animal models is a valuable resource for translating discoveries into clinical practice.UT’s relationship with Oak Ridge National Laboratory provides access to high-performance computing and artificial intelligence research. University of Tennessee Oak Ridge Innovation Institute may have resources that can be leveraged to advance select programs.Centers, such as the Smith Center for International Sustainable Agricultural Research, Center for Global Engagement, and Howard H. Baker Jr. Center for Public Policy, provide the opportunity for global connections. | **Opportunities**Identifying topic areas of faculty expertise across UTK and UTIA that cut across biomedical, human, and natural environmental science, and translational phases could assist with developing a unique human health and wellness identity for UT (e.g., Intersecting artificial Intelligence and technology to address health disparities, achieving food and nutrition security to enhance health, and multinomics and health). Several external partners (Knox County Schools, Cherokee Health Systems, University of Tennessee Medical Center, Tennessee and Knox County Health Department) have academic and research partnerships with multiple departments and/or colleges, and university-organization partnerships may assist with developing and implementing strategic initiatives in academic programming and research in human health and wellness.Three current interdisciplinary and/or multidisciplinary academic programs (Comparative and Experimental Medicine, One Health undergraduate and graduate minors) provide examples of academic programming that could be developed in additional areas, particularly one that incorporates the human science areas (missing from current interdisciplinary and/or multidisciplinary academic programs) to support training, particularly research training, at the doctoral level.Modify by-laws regarding P&T in order to assist with the development of team science approaches occurring in academic programming and research. This is needed to encourage faculty commitment by protecting their ability to advance and be promoted.Use societal issues, such as the opioid crisis, obesity, mental health concerns, as the focus for developing academic programs (a “reverse engineering approach”), as compared to using discipline specific approaches.As external funding in the human science physical area and the clinical and implementation phases of research is limited, investing resources in these areas should enhance National Institutes of Health funding abilities. Develop an inventory of research space and equipment, as well as personnel expertise, could support more efficient use of and create a culture of more shared research resources (e.g., an interdisciplinary simulation lab).Establish research partnerships (e.g., University of Tennessee Medical Center, companies with a focus on human health and wellness) at Cherokee Farm Research Park.Strengthen the relationship with Oak Ridge National Laboratory’s high-performance computing and artificial intelligence research to UTK’s healthcare research opportunities with community partners.The pandemic offers the opportunity to unite infectious disease and immunology as well as public health resources on campus to create a research program strength using a holistic approach to infectious diseases (ARPA-H may be a mechanism for this program).  |
| **Aspirations**Create an identity by prioritizing 3 to 5 areas in human health and wellness to elevate national/international visibility (e.g., intersecting artificial Intelligence and technology to address health disparities, achieving food and nutrition security to enhance health, multiomics and health, mental health and well-being, individualized medicine through big data analysis and algorithms ). This identity should combine efforts and expertise from UTK and UTIA in which UT can be seen as a leader.Develop academic programs, particularly at the doctoral level, using a One Health approach that supports the development of expertise and skills to engage in transdisciplinary, team science-oriented, translational research to solve large and complex problems in health and human wellness.Embrace a One Health approach at UT that supports transdisciplinary, team science-oriented, translational research to solve large and complex problems in health and human wellness. Extend the land grant mission of UT in human health and wellness by intentionally developing and supporting mutually beneficial and reciprocal authentic partnerships that bring together faculty and community collaborators together to address real world problems and issues.Cultivate the reputation of UTK and UTIA as being the home to Key Opinion Leaders that are seen as state and federal resources for advising on human health and wellness.Be the resource for human health and wellness for Tennessee, the Southeast, and the nation.  | **Results**Increased number of academic programs that support the development of expertise and skills to engage in in transdisciplinary, team science-oriented, translational research to solve large and complex problems in health and human wellness, using a One Health approach.Increased number of awarded doctoral degrees in human health and wellness, particularly in academic programs that support skill development in transdisciplinary, team science-oriented, translational research (e.g., interdisciplinary degrees). Increased number of awards, particularly from National Institutes of Health, and research expenditures in the area of human health and wellness.Designated shared research space and resources that do not have college or departmental boundaries for transdisciplinary, team science approaches to solve large and complex problems in health and human wellness.Department and college by-laws that support team science approaches.Greater number of tenure-track faculty, through cluster hires, that support UT’s developed identity in the area of human health and wellness.Documented strategic initiatives with key external partners that incorporate academic programming and research opportunities to support UT’s human health and wellness identity. |

## H. Identified Goals and Strategies

### H.1. Goals, Objectives, and Strategies

Based on the results of the landscape assessment and the SOAR analysis, three goals, with accompanying objectives and strategies are outlined below (the acronym HHW is not used in this section to allow this part of the document be a stand-alone document if needed).

*Goal 1*

Create a UT human health and wellness identity that combines efforts and expertise from UTK and UTIA whereby UT is positioned as a national and global leader.

**Objective*:*** Strengthen five identified thematic areas of research (e.g., intersecting artificial Intelligence and technology to address health disparities, achieving food and nutrition security to enhance health, multiomics and health, mental health and well-being, and individualized medicine through big data analysis and algorithms) that can cut across units, in which the analysis revealed a solid, foundational strength. Strategic cluster hires in these areas will further yield transdisciplinary, team science-oriented, translational research and graduate academic programming in human health and wellness.

**Strategies**

1. Develop a transdisciplinary working group for each identified theme. Each working group will ascertain UT’s current strengths, recommend key areas to enhance, and develop strategic initiatives for academic programming and research within the identified theme. This process will model a transdisciplinary, team-science approach in human health and wellness at UT.
2. Design a bylaw template that supports team science. Encourage college and departmental bylaws to be updated using this template to reflect the valuing of and commitment to collaborative team science. This process will be an important step in aligning the mission(s) of departments with the overall human health and wellness goals.
3. Conduct cluster faculty hires in the area of human health and wellness that fit within working groups’ developed strategic initiatives for academic programming and research. These positions should be selected based not on the current/immediate needs of colleges/departments to fill vacated positions in areas primarily dedicated to teaching, but rather, in areas that will serve to achieve the strategic initiatives for academic programming and research within the identified themes. Consider joint appointments for these hires to support transdisciplinary, team-science focused initiatives.
4. Increase cross-unit collaboration in research and teaching. This broad area includes:
5. Identifying interdisciplinary course offerings. To accomplish this, overlapping competencies in coursework in units that fit within the identified themes can be identified through curriculum mapping.
6. Creating interdisciplinary graduate programs and dual-degree programs, particularly those awarding doctoral degrees; certificate programs; and post-doctoral fellowships within identified themes.
7. Reallocating resources for interdisciplinary academic programming by culling discipline-specific academic programming with limited enrollment as deemed appropriate by colleges and departments.
8. Establishing incentivization models for interdisciplinary course offerings and academic programming (model must work within the budget model in place at UTK and UTIA).
9. Establish incentivization (e.g., seed funding, team-science focused F&A disbursement models) of collaborative research proposals across units in the identified theme areas.
10. Create designated shared research space and inventoried resources that do not have college or departmental boundaries for transdisciplinary, team-science approaches to solve large and complex problems in identified health and human wellness themes.

*Goal 2*

**Objective:** Identify external partners (e.g., Cherokee Health Systems, University of Tennessee Medical Center, regional and Tennessee companies with a focus on human health) to develop organizational relationships that support the development and implementation of strategic initiatives in academic programming and research that enhance UT’s human health and wellness identity.

Redefine and grow the land grant mission in UT’s human health and wellness identity by intentionally developing and supporting mutually beneficial and reciprocal authentic partnerships that bring together faculty and community collaborators.

**Strategies**

1. Create an external partner advisory board that includes local, state, and national representation of external partners, as well as representation from strategic foundation stakeholders (e.g., MacArthur, Wellcome), that can support UT’s human health and wellness identity. This advisory board can guide the development of mutually beneficial and reciprocal authentic partnerships in academic programming and research between UT and external partners.
2. For each identified partnership in which an organizational relationship is desired:
	1. Develop a transdisciplinary working group that includes representatives from UT and the external partner to develop strategic initiatives for academic programming and research that is mutually beneficial and reciprocal for UT and the external partner.
	2. Establish a structure and process by which academic programming or research can be designed and implemented by UT as the lead, the external partner as the lead, or as UT and the external partner as joint leads.
	3. Identify UT resources (e.g., partnership coordinator, space, faculty expertise, equipment) that can support the strategic initiatives of the partnership.
	4. Create shared space (e.g., facilities at Cherokee Farm Research Park, co-located space in the community) that can support the strategic initiatives of the partnership.

*Goal 3*

Enhance translational expertise in UT’s human health and wellness identity to support UT participating in state-wide academic programming and research partnerships.

**Objective:** Strengthen faculty expertise, via faculty cluster hires, and infrastructure, via modernized space and equipment, in the three human health and wellness science areas (biomedical, human, and natural environmental science) to support UT’s human health and wellness identity to lead the state in transdisciplinary, team science-oriented, full-spectrum translational research and graduate academic programming.

**Strategies**

1. Create cluster hires in UT’s human health and wellness identity to strengthen faculty expertise in the human science physical area and the clinical and implementation phases of research. Currently, these areas limit the ability to engage in full-spectrum translational research in human health and wellness due to low-tenure track faculty numbers (external funding in these areas is low), combined with high degree awarding academic programs. The data indicate these faculty expertise areas have limited capability of growth without additional faculty. Cluster hires focused on strengthening faculty expertise in the human science physical area and the clinical and implementation phases of research should enhance UT’s ability to engage in full-spectrum translational research and graduate academic programming in human health and wellness.
2. Support infrastructure enhancement (e.g., space, equipment, bylaws, financial resource distribution from academic and research initiatives) of transdisciplinary, team science-oriented, full-spectrum translational research and graduate academic programming. Focus of infrastructure enhancement should be to support UT’s human health and wellness identify, as well as to adequately strengthen all science areas (biomedical, human, and natural environment) and translational stages, recognizing that some areas and stages may need more support than others. Decisions should focus on developing shared space, efficient methods to increase access to and maintenance of cutting-edge equipment, bylaws that support research and academic training that encourages team-science approaches, and financial models that incentivize interdisciplinary academic programming and team-science research.
3. Create a statewide research and academic partnership that incorporates the UT system, governmental entities, and community partners to enhance ability to conduct full-spectrum translational research and academic programming that can improve the health and wellness of all Tennesseans (for an example see https://indianactsi.org). In particular, this allows UTK and UTIA to partner with UT Health Science Center, leveraging the expertise of the different disciplines at each campus, in developing full-spectrum translational research initiatives and unique academic programming (MD-PhD programs), that each campus can’t achieve on its own.
4. Seek National Institutes of Health large center funding (center core grants, clinical and translational science awards) to support the infrastructure for transdisciplinary, team science-oriented, full-spectrum translational research and research training.

### H.2. Recommended Implementation and Governing Structure for Goals and Strategies

The development of an overlay structure is recommended to achieve the identified goals and strategies. This structure should assist with promoting collaboration across units. This model introduces cross-cutting structures, leadership positions, or nodal centers to promote interdisciplinary activity. This is one of the four alternatives to UT’s current structure proposed by the Academic Structures Working Group *(https://provost.utk.edu/wp-content/uploads/sites/10/2021/11/ASWG\_report\_11\_05\_2021.pdf).*

To initiate the overlay structure, it is recommended that a governing human health and wellness committee be developed. This committee should have two co-chairs, with one co-chair from UTK and one co-chair from UTIA. The co-chairs should be faculty/administrators with leadership experience, national scholarship recognition in human health and wellness, and a significant history of external funding. At least one co-chair of the governing committee should also serve as a member of each transdisciplinary working group developed for each identified theme in goal 1. The governing committee should have one representative from each science area (biomedical, human science education, human science physical, human science social, and natural environmental science) and college that represented the units in Figure 1 (Agriculture; Arts & Science; Education, Health, and Human Sciences; Engineering; Nursing; Social Work; and Veterinary Medicine). It is suggested that the governing committee oversee the implementation of the recommended goals and strategies and monitor progress on achieving expected outcomes.

### H.3. Anticipated Outcomes

The goals, objectives, and strategies should produce several outcomes important to UT’s strategic vision *(*[*https://www.utk.edu/images/i/warmers/strategic-vision-2021.pdf*](https://www.utk.edu/images/i/warmers/strategic-vision-2021.pdf)*)*. These outcomes include greater innovative interdisciplinary curricula available to students; increased graduate enrollment, particularly in doctoral programs; greater national and international rankings of the academic colleges and their academic programs; increased research expenditures; a higher HERD ranking (public universities without a medical school); and a greater number of off-campus engagements with Tennessee communities.

## G. Campus Engagement

The same four-step framework that the Academic Structures Working Group recommended to guide campus engagement is recommended by this working group (See **Table 8**). This framework sets a strategic direction for the engagement process and describes essential components.

****

**Table 8. Framework to Guide Campus Engagement**

This framework has been used from the initial stages of the HHW working group. Once the units included in the landscape assessment were identified, the co-chairs of the working group held sessions in which leaders of the units were invited to hear about the objectives, processes, and meeting plans of the working group, leadership had the opportunity to provide feedback on the proposed process. Additional campus activities (townhall on research-practice partnerships and signing event with Cherokee Health Systems that was done in collaboration with the Howard H. Baker Jr. Center for Public Policy) have been held to communicate progress in the working group. The co-chairs of the working group will hold sessions to communicate the report to leadership of the units included in the landscape assessment, and offer informational meetings to the 25 units as requested.

## References

1. UK Health Departments. The Future of the Healthcare Science Workforce: Modernising Scientific Careers: The Next Steps. United Kingdom; 2009. https://www.ahcs.ac.uk/wordpress/wp-content/uploads/2013/09/MSC-Consultation-the-future-of-the-HCS-Workfoce-dh\_091533.pdf

2. Substance Abuse and Mental Health Services Administration. Creating a Healthier Life: A Step-by-Step Guide to Wellness. SAMSHA; 2016. https://store.samhsa.gov/sites/default/files/d7/priv/sma16-4958.pdf

3. National Institutes of Health, National Center for Advancing Translational Sciences. Transational Science Spectrum. https://ncats.nih.gov/translation/spectrum. Published 2021. Accessed November 11, 2021.

4. Czajkowski SM, Lynch MR, Hall KL, et al. Transdisciplinary translational behavioral (TDTB) research: Opportunities, barriers, and innovations. *Translational Behavioral Medicine.* 2016;6:32-43.

5. National Institutes of Health, National Institute of Environmental Health Sciences. Translational Research Framework. https://www.niehs.nih.gov/research/programs/translational/framework-details/index.cfm. Published 2019. Accessed March 16, 2022.

6. Thompson Klein J, Falk-Krzesinskib HJ. Interdisciplinary and collaborative work: Framing promotion and tenure practices and policies. *Research Policy.* 2017;46:1055-1061.

7. McHale SM, Ranwala D, DiazGranados D, Bagshaw D, Schienke E, Blank AE. Promotion and tenure policies for team science at colleges/schools of medicine. *Journal of Clinical and Translational Science.* 2019;3:245–252.

8. Choi BC, Pak AW. Multidisciplinarity, interdisciplinarity and transdisciplinarity in health research, services, education and policy: 1. Definitions, objectives, and evidence of effectiveness. *Clinical and Investigative Medicine.* 2006;29:351-364.

9. University Leadership Council. *Aligning Promotion and Tenure Policies to Promote Interdisciplinary Research.* Washington DC; 2010. https://www.uky.edu/ie/sites/www.uky.edu.ie/files/uploads/EAB\_RM\_Aligning-Promotion-and-Tenure-Policies-to-Promote-Interdisciplinary-Research.pdf

## Appendix A: Members of Human Health and Wellness Working Group

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Member** | **Position** | **Campus** | **College** | **Unit** |
| David Anderson | Associate Dean for Research and Graduate Studies | UTIA | Veterinary Medicine |  |
| Patricia Bamwine | Assistant Professor | UTK | Social Work |  |
| Shandra Forrest- Bank | Associate Professor, Director of SWORPS | UTK | Social Work | Social Work Office of Research and Public Service |
| Eric Boder | Associate Professor | UTK | Tickle College of Engineering | Chemical and Biomolecular Engineering |
| Doug Coatsworth | Associate Dean for Research  | UTK | Social Work |  |
| Sarah Colby | Associate Professor | UTK | Education, Health, and Human Sciences | Nutrition |
| Anne Conway | Associate Professor | UTK | Social Work |  |
| Scott Crouter | Associate Professor | UTK | Education, Health, and Human Sciences | Kinesiology, Recreation & Sport Studies |
| Brad Day | Associate Vice Chancellor for Research and Innovation Initiatives | UTK |  | Office of Research, Innovation, and Economic Development |
| Bill Dunne | Associate Dean, Research & Facilities | UTK | Tickle College of Engineering | Earth & Planetary Sciences |
| Nina Fefferman | Professor, Director of NIMBioS | UTK | Arts & Sciences | Ecology & Evolutionary Biology |
| Elizabeth Fozo | Associate Professor | UTK | Arts & Sciences | Microbiology |
| Kristi Gordon | Associate Dean of Academic Affairs and Engagement | UTK | Education, Health, and Human Sciences | Child and Family Studies |
| Paul Hauptman | Dean, Graduate School of Medicine | UTMC | Graduate School of Medicine |  |
| Ozlem Kilic | Associate Dean for Academic and Student Affairs | UTK | Tickle College of Engineering | Electrical Engineering and Computer Science |
| Anahita Khojandi | Associate Professor, Director of the RME Program | UTK | Tickle College of Engineering | Industrial & Systems Engineering |
| Nicole McFarlane | Associate Professor | UTK | Tickle College of Engineering | Electrical Engineering and Computer Science |
| Larry McKay | Associate Dean for Research and Facilities | UTK | Arts & Sciences | Earth and Planetary Sciences |
| Deb Miller | Professor, Director of the University of Tennessee One Health Initiative | UTIA | Veterinary Medicine and Herbert | Biomedical & Diagnostic Sciences and Forestry, Wildlife and Fisheries |
| Jen Miller | Assistant Professor | UTK | Nursing |  |
| Todd Moore | Associate Dean for Academic Programs | UTK | Arts & Sciences | Psychology |
| Carole R. Myers | Professor, Associate Director of the University of Tennessee One Health Initiative | UTK | Nursing |  |
| Sarah Pruett | Assistant Vice Chancellor for the Responsible Conduct of Research | UTK |  | Office of Research, Innovation, and Economic Development |
| Hollie Raynor | Associate Dean for Research  | UTK | Education, Health, and Human Sciences | Nutrition |
| Todd Reynolds | Professor | UTK | Arts & Sciences | Microbiology |
| Caleb Rucker | Associate Professor | UTK | Tickle College of Engineering | Mechanical, Aerospace and Biomedical Engineering |
| Jeremy Smith | Governor’s Chair Professor, Director, UT/ORNL Center for Molecular Biophysics | UTK | Arts & Sciences | Biochemistry & Cellular and Molecular Biology |
| Dawnie Steadman | Professor, Director, Forensic Anthropology Center | UTK | Arts & Sciences | Anthropology |
| Elizabeth Strand | Clinical Associate Professor | UTK/UTIA | Social Work/Veterinary Medicine |  |
| David White | Associate Dean for Research, Associate Director of the Agricultural Experiment Station | UTIA | UT AgResearch |  |
| Tami Wyatt | Associate Dean of Research | UTK | Nursing |  |

## Appendix B: Human Health and Wellness Keywords

|  |  |
| --- | --- |
|  |  |
| Adolescent, agriculture, AI, air pollutant, air pollutants, air pollution, Alzheimer's, anesthesia, animal health, animal model, anxiety, arthritis, artificial intelligence, behavioral, biodiversity, Biodiversity conservation, bio-electronics, bioengineering, biomedical, biomedical engineering, biomolecular engineering, biotechnology, breast cancer, cancer, carcinogen, cardiac surgery survivors, cardiovascular disease, cell biology, cellular biomechanics, child, chronic disease, climate, climate change, climatic, climatic changes, clinical, clinical trial, cognition/cognitive, communicable disease, community, computational biofluid mechanics, computational biomedicine, concurrent care, conservation, contaminated, contamination, coronavirus, dementia, depression, diabetes, diet, disease, disease management, ecological, ecology, effect on environment, effects on environment, emotional wellness, endangered species, environment, environmental, environmental aspect, environmental aspects, environmental degradation, environmental disaster, environmental disasters, environmental engineering, environmental ethics, environmental health, environmental indicator, environmental indicators, environmental toxicology, environmentalism, environmentally induced diseases, epidemic, epidemiology, evidence-based, exercise, extinction, factory and trade waste, family caregivers, farmland, fatigue, feedgrounds, feedstock, fertilizer, fertilizers, fitness, food, food contamination, food processing, food production, foodborne illness, forest conservation, forest ecology, forest pollution, forestry science, freshwater, fungal, genome focused bioinformatics, global environmental change, global environmental changes, global temperature change, global temperature changes, global warming, hazardous substance, hazardous substances, hazardous waste, hazardous waste site, hazardous waste sites, health, health care systems engineering, health condition, health disparities, health equity, health information technology & mobile health, health promotion, health risk, health risk assessment, health of all life on Earth, healthcare, healthier life, heart disease, hereditary cancer, housing and health, human ecology, human effect on environment, human geography, human health, hurricane damage, hypertension, immune, immune system, immunity, immunization, immunology, indoor air pollution, industrial biotechnology, industrial design, industrial management, industrial toxicology, infection, infectious, infectious disease injury, insect pests, intellectual wellness, integrative environment, invasive, LGBTQ, lung disease, marine conservation, marine pollution, medical decision making, medication, medicine, mental, microbiome, microfluidics for medicine, morbidity, mortality, muscular injury, nanomedicine, natural food, natural foods, natural product, natural products, natural resource, natural resources, nature conservation, neonatal, new age consumer, new age consumers, NIH, nitrate, nitrates, nurse, nutrient, nutrition, obesity, occupational disease, occupational diseases, oil pollution, oil spill, oil spills, opioid, pandemic, pathogen, patient, pediatric, pediatric toxicology, permaculture, pesticide, pesticides, pesticides and wildlife, pesticides toxicology, pharmaceutical, physical activity, physical wellness, plant health, pollutant, pollutants, pollution, pollution control industry, pollution prevention, poverty, prenatal, processed food, processed foods, proteins, psychosocial, public health, recovery, recycling, regenerative science, regenerative medicine, rehabilitation, rehabilitation science, rehabilitative medicine, respiratory disease, rural, sleep, smoking, social determinants, social, ecological model, social ecology, social responsibility, social wellness, societal impact, societal impacts, soil conservation, soil ecology, soil pollution, soil science, speech, spiritual wellness, stem cell, stroke, sulfates, sustainability, sustainable agriculture, sustainable architecture, sustainable building, sustainable buildings, sustainable construction, sustainable design, sustainable development, sustainable engineering, sustainable living, sustainable urban development, systems physiology, systems science, therapy, tissue engineering, tobacco control, toxicology, toxins, translational science, trauma biomechanics, treatment, urban ecology, urban health, urbanization, USDA, vaccination, vaccine, vector borne disease, waste minimalization, waste minimization, waste product, waste products, wastewater, water conservation, water pollution, wellness, wildlife conservation, zoonotic disease |

|  |
| --- |
| Appendix C: Human Health and Wellness Degrees Awarded During Academic Years2020-2021, 2019-2020, and 2018-2019\* |
|  | **2020-2021** | **2019-2020** | **2018-2019** |
| All degrees, n BS HS-E HS-P HS-S NES | 457186786846641 | 500225830857614 | 427183761789642 |
| All degrees from programs in Basic/Fundamental phase, n (% of degrees in a science area) BS HS-E HS-P HS-S NES | 252 (55.1)0 (0.0)0 (0.0)0 (0.0)125 (19.5) | 250 (50.0)0 (0.0)0 (0.0)0 (0.0)207 (33.7) | 220 (51.5)0 (0.0)0 (0.0)0 (0.0)180 (28.0) |
| All degrees from programs in Preclinical/Application & Synthesis phase, n (% of degrees in a science area) BS HS-E HS-P HS-S NES | 70 (15.3)0 (0.0)0 (0.0)13 (1.5)56 (8.7) | 127 (25.4)0 (0.0)0 (0.0)69 (8.1)54 (8.8) | 78 (18.3)0 (0.0)0 (0.0)10 (1.3)64 (10.0) |
| All degrees from programs in Clinical/Implementation & Adjustment phase, n (% of degrees in a science area) BS HS-E HS-P HS-S NES | 193 (42.2)148 (79.6)713 (90.7)411 (48.6)291 (45.4) | 181 (36.2)178 (79.1)770 (92.8)350 (40.8)361 (58.8) | 196 (45.9)148 (80.9)697 (91.6)362 (46.0)398 (62.0) |
| All degrees from programs in Clinical Implementation/Practice phase, n (% of degrees in a science area) BS HS-E HS-P HS-S NES | 0 (0.0)37 (19.9)140 (17.8)325 (38.4)88 (13.7) | 0 (0.0)40 (22.5)140 (16.9)332 (38.7)83 (13.5) | 0 (0.0)28 (15.3)127 (16.7)297 (37.7)110 (17.1) |
| All degrees from programs in Public Health/Impact phase, n (% of degrees in a science area) BS HS-E HS-P HS-S NES | 0 (0.0)1 (1.0)32 (4.1)115 (13.6)22 (3.4) | 0 (0.0)7 (3.9)28 (3.4)116 (13.5)16 (2.6) | 0 (0.0)7 (3.8)32 (4.2)142 (18.0)30 (4.7) |
| All degrees with multiple translational phases, n (% of degrees in a science area) BS HS-E HS-P HS-S NES | 58 (12.7)0 (0.0)99 (12.6)15 (1.8)110 (17.2) | 5 (1.0)0 (0.0)108 (13.0)14 (1.6)99 (16.1) | 69 (16.2)0 (0.0)95 (12.5)21 (2.7)130 (20.2) |
| Bachelor degrees, n (% of all degrees in a science area) BS HS-E HS-P HS-S NES | 329 (72.0)113 (60.8)628 (79.9)526 (62.2)454 (70.8) | 374 (74.8)127 (56.4)686 (82.7)526 (61.4)435 (70.8)  | 298 (69.8)123 (67.2)589 (77.4)496 (62.9)442 (68.8) |
| Bachelor degrees from programs in Basic/Fundamental phase, n (% of bachelor degrees in a science area) BS HS-E HS-P HS-S NES | 232 (70.5)0 (0.0)0 (0.0)0 (0.0)159 (35.0) | 218 (58.3)0 (0.0)0 (0.0)0 (0.0)164 (37.7) | 196 (65.8)0 (0.0)0 (0.0)0 (0.0)139 (31.4) |
| Bachelor degrees from programs in Preclinical/Application & Synthesis phase, n (% of bachelor degrees in a science area) BS HS-E HS-P HS-S NES | 45 (13.7)0 (0.0)0 (0.0)3 (0.1)4 (0.1) | 104 (27.8)0 (0.0)0 (0.0)58 (11.0)9 (2.1) | 51 (17.1)0 (0.0)0 (0.0)0 (0.0)5 (1.1) |
| Bachelor degrees from programs in Clinical/Implementation & Adjustment phase, n (% of bachelor degrees in a science area) BS HS-E HS-P HS-S NES | 94 (28.6)113 (100.0)628 (100.0)370 (70.3)263 (57.9) | 98 (26.2)127 (100.0)686 (100.0)315 (59.9)238 (54.7) | 100 (33.6)123 (100.0)589 (100.0)323 (65.1)252 (57.0) |
| Bachelor degrees from programs in Clinical Implementation/Practice phase, n (% of bachelor degrees in a science area) BS HS-E HS-P HS-S NES | 0 (0.0)0 (0.0)85 (13.5)53 (10.1)86 (18.9) | 0 (0.0)0 (0.0)93 (13.6)58 (11.0)74 (17.0) | 0 (0.0)0 (0.0)81 (13.8)60 (12.1)101 (22.9) |
| Bachelor degrees from programs in Public Health/Impact phase, n (% of bachelor degrees in a science area) BS HS-E HS-P HS-S NES | 0 (0.0)0 (0.0)0 (0.0)104 (19.8)22 (4.8) | 0 (0.0)0 (0.0)0 (0.0)96 (18.3)16 (3.7) | 0 (0.0)0 (0.0)0 (0.0)122 (24.6)30 (6.8) |
| Bachelor degrees from programs with multiple translational phases, n (% of bachelor degrees in a science area) BS HS-E HS-P HS-S NES | 42 (12.8)0 (0.0)85 (13.5)1 (0.0)79 (17.4) | 46 (12.3)0 (0.0)93 (13.6)1 (0.0)60 (13.8) | 51 (17.1)0 (0.0)81 (13.8)9 (1.8)77 (17.4) |
| Master degrees, n (% of all degrees in a science area) BS HS-E HS-P HS-S NES | 106 (23.2)51 (27.4)141 (17.9)288 (34.0)134 (20.9) | 101 (20.2)66 (29.3)122 (14.7)293 (34.2)134 (21.8) | 103 (24.1)43 (23.5)162 (21.3)251 (31.8)156 (24.3) |
| Master degrees from programs in Basic/Fundamental phase, n (% of master degrees in a science area) BS HS-E HS-P HS-S NES | 5 (4.7)0 (0.0)0 (0.0)0 (0.0)13 (9.7) | 12 (11.9)0 (0.0)0 (0.0)0 (0.0)25 (17.9)  | 6 (5.8)0 (0.0)0 (0.0)0 (0.0)22 (14.1) |
| Master degrees from programs in Preclinical/Application & Synthesis phase, n (% of master degrees in a science area) BS HS-E HS-P HS-S NES | 13 (12.3)0 (0.0)0 (0.0)5 (1.7)25 (18.7) | 16 (15.8)0 (0.0)0 (0.0)7 (2.4)25 (17.9)  | 15 (14.6)0 (0.0)0 (0.0)3 (1.2)42 (26.9) |
| Master degrees from programs in Clinical/Implementation & Adjustment phase, n (% of master degrees in a science area) BS HS-E HS-P HS-S NES | 97 (91.5)26 (51.0)71 (50.4)22 (7.6)10 (80.6) | 82 (81.2)35 (53.0)65 (53.3)13 (4.4)99 (73.9) | 95 (92.2)19 (44.2)104 (64.2)17 (6.8)123 (79.9) |
| Master degrees from programs in Clinical Implementation/Practice phase, n (% of master degrees in a science area) BS HS-E HS-P HS-S NES | 0 (0.0)24 (47.1)52 (36.9)258 (89.6)0 (0.0) | 0 (0.0)29 (43.9)46 (37.7)265 (90.4)0 (0.0) | 0 (0.0)20 (46.5)44 (24.7)225 (89.6)0 (0.0) |
| Master degrees from programs in Public Health/Impact phase, n (% of master degrees in a science area) BS HS-E HS-P HS-S NES | 0 (0.0)1 (1.9)29 (20.6)3 (1.0)0 (0.0) | 0 (0.0)2 (3.0)25 (20.5)8 (2.7)0 (0.0) | 0 (0.0)4 (9.3)26 (16.0)6 (2.4)0 (0.0) |
| Master degrees from programs with multiple translational phases, n (% of master degrees in a science area) BS HS-E HS-P HS-S NES | 9 (8.5)0 (0.0)11 (31.2)0 (0.0)13 (9.7) | 9 (8.9)0 (0.0)14 (11.5)0 (0.0)15 (11.2)  | 13 (12.6)0 (0.0)12 (7.4)0 (0.0)30 (19.2) |
| Doctoral degrees, n (% of all degrees in a science area) BS HS-E HS-P HS-S NES | 22 (4.8)22 (11.8)17 (2.1)32 (3.8)53 (8.3) | 25 (5.0)32 (14.2)22 (2.7)38 (4.4)45 (7.3) | 26 (6.1)17 (9.3)10 (1.3)42 (5.3)44 (6.9) |
| Doctoral degrees from programs in Basic/Fundamental phase, n (% of doctoral degrees in a science area) BS HS-E HS-P HS-S NES | 15 (68.2)0 (0.0)0 (0.0)0 (0.0)33 (62.3) | 20 (80.0)0 (0.0)0 (0.0)0 (0.0)18 (37.5) | 18 (69.2)0 (0.0)0 (0.0)0 (0.0)19 (43.2) |
| Doctoral degrees from programs in Preclinical/Application & Synthesis phase, n (% of doctoral degrees in a science area) BS HS-E HS-P HS-S NES | 12 (54.5)0 (0.0)0 (0.0)5 (15.6)27 (50.9) | 7 (28.0)0 (0.0)0 (0.0)4 (10.5)20 (44.4) | 12 (46.2)0 (0.0)0 (0.0)7 (16.7)17 (38.6) |
| Doctoral degrees from programs in Clinical/Implementation & Adjustment phase, n (% of doctoral degrees in a science area) BS HS-E HS-P HS-S NES | 2 (9.1)9 (40.9)14 (82.4)19 (59.4)18 (34.0) | 1 (4.0)16 (50.0)19 (86.4)22 (57.9)24 (53.3) | 1 (3.8)6 (35.3)4 (40.0)22 (52.4)23 (52.3) |
| Doctoral degrees from programs in Clinical Implementation/Practice phase, n (% of doctoral degrees in a science area) BS HS-E HS-P HS-S NES | 0 (0.0)13 (59.1)3 (17.6)14 (43.8)2 (3.8) | 0 (0.0)11 (34.4)1 (4.5)9 (23.7)9 (20.0) | 0 (0.)8 (47.1)2 (20.0)12 (28.6)9 (20.5) |
| Doctoral degrees from programs in Public Health/Impact phase, n (% of doctoral degrees in a science area) BS HS-E HS-P HS-S NES | 0 (0.0)0 (0.0)3 (17.6)8 (25.0)0 (0.0) | 0 (0.0)5 (15.6)3 (13.6)12 (31.6)0 (0.0) | 0 (0.0)3 (17.6)6 (60.0)14 (33.3)0 (0.0) |
| Doctoral degrees from programs with multiple translational phases, n (% of doctoral degrees in a science area) BS HS-E HS-P HS-S NES | 7 (31.8)0 (0.0)3 (17.6)14 (43.8)18 (34.0) | 3 (12.0)0 (0.0)1 (4.5)13 (34.2)24 (53.3) | 5 (19.2)0 (0.0)2 (20.0)12 (28.6)23 (52.3) |
| \*Awards may be included in more than one science and translational area. BS = Biomedical science; HS-E = Human science – education; HS-P = Human science – physical; HS-S = Human science – social; NES = Natural environmental science. |