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East Carolina University

Comprehensive Master Plan

Health Demand Analysis

Final Report
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EAST CAROLINA UNIVERSITY HEALTH SCIENCES CENTER

1. Introduction - Overarching Perspectives, Observations, Limitations, & Working Assumptions

In 2001, the Institute of Medicine published "Crossing the Quality Chasm". The book release was a sentinel event for health professions education and care delivery. Its publication triggered a flurry of activity to redefine both educational programs and care delivery models as evidenced by various reports which begin to define the problem in more detail and create care models focusing on patient care quality and safety.

Health professions practice has changed tremendously over the last century. Not only has it changed, new professions have been added as health care has become more complex in response to evidence based medicine and increasing technology. Surprisingly, though, health professions education has remained relatively unchanged. Most health professions schools rely heavily on lectures and memorization by facts although simulation laboratories are emerging to allow the respective student to develop care skills and apply knowledge prior to actual clinical encounters. Such encounters in a real-time clinical setting are an integral part of the professional caregivers' necessary experienced-based curriculum.

Unfortunately, most professional schools still educate their students in isolation from other professions while healthcare practice is a team effort. Curriculum changes and new models of care are necessary to prepare students for the future of healthcare. In addition, any requisite facilities must facilitate current and anticipated curriculum changes and care delivery models.

Working Premise - Inter-disciplinary care delivery and inter-professional education

A team-based approach to clinical care is optimum and the curriculum in and between health professions schools must foster integration, and necessary clinical environments also must facilitate an integrated / team-based care delivery model. Inter-disciplinary and inter-professional education, as well as care delivery, is the future. This future state must be reflected in facility developments which foster integration.

Implications

Various implications emerge from the working premise; key ones are:

- Integration faces many challenges, not the least of them culture, history, and tradition.
- Basic science and clinical integration at all levels will:
    - Solidify and reinforce team-based learning.
    - Assist in developing critical thinking skills.
    - Foster faculty interaction and collaboration.
    - Foster health professions interaction, team-building, and collaboration.
    - Facilitate translational medicine as well as evidence-based care delivery models.
- Both vertical and horizontal integration in the basic and clinical sciences will be necessary.
- Faculty development is paramount.
- Facility development must foster integration models.

Healthcare is increasingly complex and faces ever increasing challenges to provide safe and quality care to diverse populations. A collective vision for ECU's Health Science Center Master Plan development is a prerequisite if it is to become a leader in health professions education which requires continuous adaptation to an ever changing healthcare landscape.

2. Organizational Aspirations And Conceptual Vision

The Vision for the Health Sciences Center is to create an integrated humanistic-oriented community-based care delivery, education, and research model.

3. Integration Models

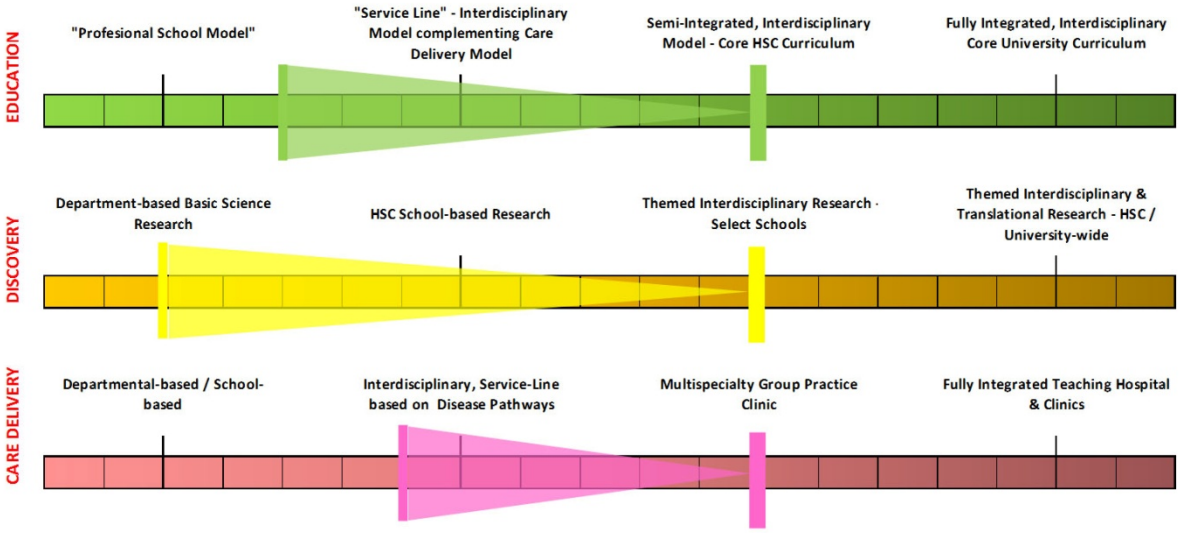
The emerging reality for the academic health sciences center is significantly more integrated from a strategic perspective. Clinical programs will be closely integrated with research and regional / rural health care delivery and education. Enhanced community linkages will drive economic growth and development, as well as enhance wellness and the quality of public health. Integrated facilities for research, teaching and clinical campuses will become the norm; shared research with industry genomics and biotech partners will enhance health science center operating positions. Global linkages for research collaboration and data analysis enhanced by high capacity computer networks for data transfer, and regional tissue banks for clinical research will create a new 'community health resource' identity for our heath science centers.

The degree of integration within the academic medical center is variable and often driven as much by cultural values as pedagogic philosophy. The major driver of integration as a response to an era of resource constraints, however, is consistent; enhanced alignment offers many benefits:

- Increased productivity
- Reduced duplication
- Support of knowledge management
- Support of emerging disciplines
- Development of evidence-basis
- Optimized care delivery
- Enhanced safety, quality & value

A 'continuum-of-integration' has been introduced and a set of current and future-state scenarios developed with health sciences center leadership that indicate the goals for the academic, discovery and clinical care components of the health sciences center. The working model suggests the following long-term developments:

- Education - will develop toward a semi-integrated, interdisciplinary model with a core health sciences curriculum over time.
- Discovery - will develop toward a themed interdisciplinary research model across selected schools on both the east and west campuses.
- Clinical Care - will develop toward a multispecialty group practice clinic model with closer integration with clinical care delivery partners throughout eastern North Carolina.



4. Integrated Facility Constructs

Clinical / Educational Integration

Given existing fragmentation primarily based on facilities developed for various physician specialties or clinical programs (e.g. Family Practice, Cardiovascular, Cancer, etc.), we suggest developing a substantial facility based on a multi-specialty clinic model, including a comprehensive cancer care center in the long term. Such a facility will foster clinical-based education and care delivery models most likely to be encountered once students graduate. The new facility must recognize certain on-campus facilities such as the cardiovascular center and family practice center, while providing the basis for a fully integrated clinical and clinical education program. One of the key programmatic elements of this type of integration is the development of a centralized patient diagnostics and support facility; one in which a consistent level of patient information, initial diagnosis and appropriate care pathway is developed.

Education / Discovery Integration

This same type of integration as discussed above may also be envisioned for basic sciences education and research. Most health science students are required to learn the same basic sciences curriculum. Quite often the same teaching faculty also have their own independent research labs. The formal development of an integrated basic sciences curriculum would be enhanced by the basic sciences

teaching labs being co-located with basic science research labs sharing common core and support lab facilities. This type of facility would relocate basic science education programs out of their current fragmented locations allowing current space to be reallocated for expanded educational or support functions in the individual colleges. This level of integration could also expand to basic sciences departments on the east campus.

The various professional schools and anticipated school of public health must develop facilities which foster integration at the basic science as well as clinical science level not withstanding integrated research and translational research programs.

5. Growth Projection Models

The focus of this section is related to physician office visits and their relevance to the overall Master Plan effort. More specifically, how the planned growth in the Brody School of Medicine will impact on clinical facility requirements.

Education programs within the various professional schools housed on the Health Science Center Campus, in particular the nursing school and Brody School of Medicine, require both undergraduate and graduate students participate in clinical activities directly related to fulfilling their respective educational requirements. On-campus clinical programs are provided in University operated clinics and also at Pitt County Memorial Hospital (a University Health System) with whom there are various affiliation agreements. Hence, the need to analyze the current physician related office visits and related market share to evaluate how best to provide for future clinical resources and their supporting infrastructure.

The market analysis determined that:

- Current Primary Service Area and Secondary Service Area growth will not provide sufficient clinical material to support medical school growth.
- Additional market-based growth and market share increases will be necessary to support clinical education … strategic relationships must be defined.
- Additional program / satellite locations will be necessary to provide sufficient educational / research venues for anticipated education and research program growth.

Our initial observations include:

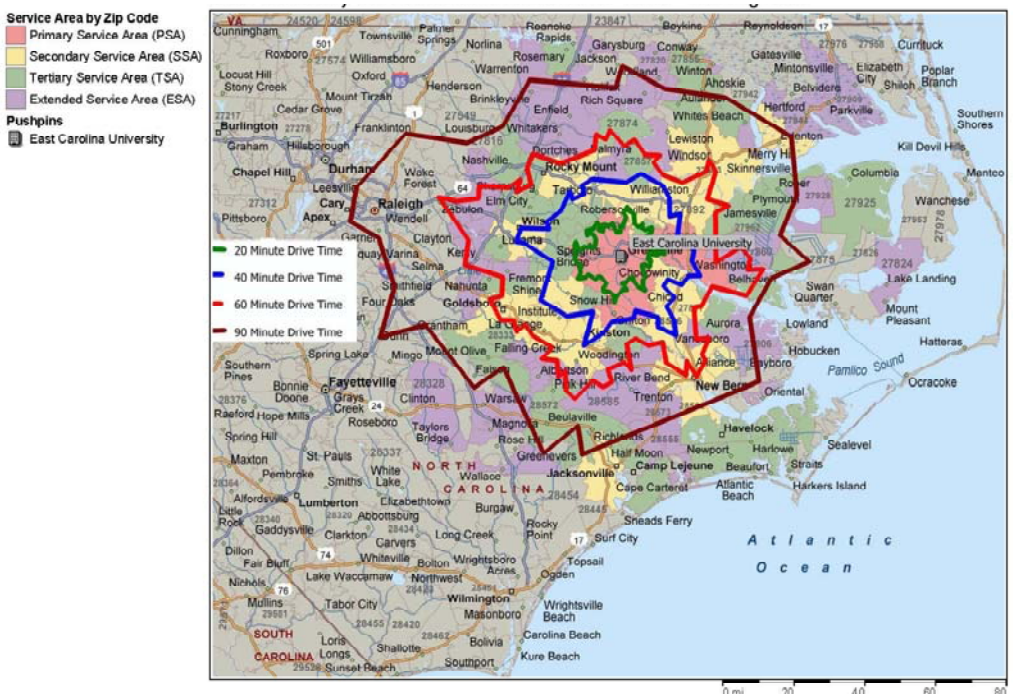
- The current on-campus facility development philosophy is based on a fragmented delivery system or a health-mall model which may not be sustainable or necessarily desirable given wayfinding / access considerations as well as available land.
- New facilities such as the Moyes foster continued fragmentation (not integration). Acquiring existing Greenville-based practices also fosters fragmented delivery and educational models.

Market

The market analysis determined that:

- The target market (Exhibit A) extends to over 90-minutes to the north and east and 180 minutes travel time to the south.

Exhibit A – ECU Ambulatory Care Service Areas with Drive Time



- The population growth alone in the target market area, let alone the closer-in primary and secondary service area population, will not support the increase in required patients necessary for the Brody expansion. An increase in relative market share will also be required. The population growth in the PSA, SSA, and TSA is expected to grow by 23,426 in the period 2009-2014 or 2.4% from 986,182 to 1,009,608 people. This population increase will generate approximately 71,800 new physician office visits, on the average, based on National Ambulatory Care Survey (National Center for Health Statistics, 2006) utilization rate data. On the average, a proportional increase of 95,000 faculty physician office visits will be required.
- For the 12-month period July 2008 – July 2009 the total ECU physician office visits were 189,235; 142,783 or 75.5% of which were attributed to faculty physicians (Table 1, see below). Assuming a 50% increase in students and a proportional growth in physician office visits to support the clinical program, an additional 95,000 office visits will be necessary which is not supported by population growth alone, locally or within the target market area.
- ECU must increase its market share in order to provide sufficient patients for the planned Brody growth. It goes without saying, related faculty expansion is also necessary along with the requisite facilities. Again, on the average, this will require an additional 107 faculty physicians, proportionately.
- In addition to ambulatory program growth, Brody must also develop expanded affiliations with hospital providers to ensure sufficient inpatient capacity for this component of their educational program.

- Satellite training centers will be required based on a distributed educational model.

Thus, the overall premise emerging from this macro-market analysis is that ECU and its Brody School of Medicine must increase its presence and market share in order to ensure adequate patients to support its educational program, in particular, those ambulatory patients seen in physician offices.

Market Share Methodology

The methodology used to both estimate current market share also the market potential for physician office visits is as follows:

Step 1 Develop target market geographic parameters (management assumptions).

Step 2 Profile current patient origin by arrived physician visits; array by visit frequency by zip code.

Step 3 Develop parameters for market designations; Primary Service Area (PSA; ± 50%); Secondary Service Area (SSA; ± 51 – 75%); Tertiary Service Area (TSA; ± 76 – 90%); Extended Service Area (ESA; ± 91 – 95%); other North Carolina and out of state based on physician designations (Faculty, Fellow, Residents).

Step 4 Differentiate data in task 2 above by faculty physician, fellows, and also residents.

Step 5 Profile 2009 estimated population by zip code.

Step 6 Estimate market potential by zip code on expected annual visits to physician offices per year per person based on average expected visits / person / year.

Note: The latest available data from the National Ambulatory Medical Care Survey is from 2006. The average number of physician offices indicates a rate of 3.066 per person. This rate was used to estimate the market and market share. It should be considered an indication of market potential, but not an absolute measure, in that not all visits result in a physician encounter and there are no adjustments for demographic characteristics nor regional variation, amongst other variables. It is, however, considered an order of magnitude surrogate for planning purposes.

Step 7 Calculate ECU market share based on actual versus derived market potential.

Step 8 Derive market opportunity for physician office visits by zip code.

Step 9 Analyze data to identify potential sub-markets to further evaluate for development.

Step 10 Interpret / analyze as appropriate for the overarching purpose.

Limitations

This macro-analysis is directional in nature. Market specific comparative data is not available. Thus, the actual market for physician office visits may vary from that derived from the assumptions herein. In addition, no adjustments were made for demographic characteristics and local / regional use rates or adjusting the data to reflect physician encounters versus physician office visits. We believe at the macro level, the analysis provides a basis for more focused planning.

High-Level Findings and Observations

- The basis for this macro-market analysis is based on the following utilization data.

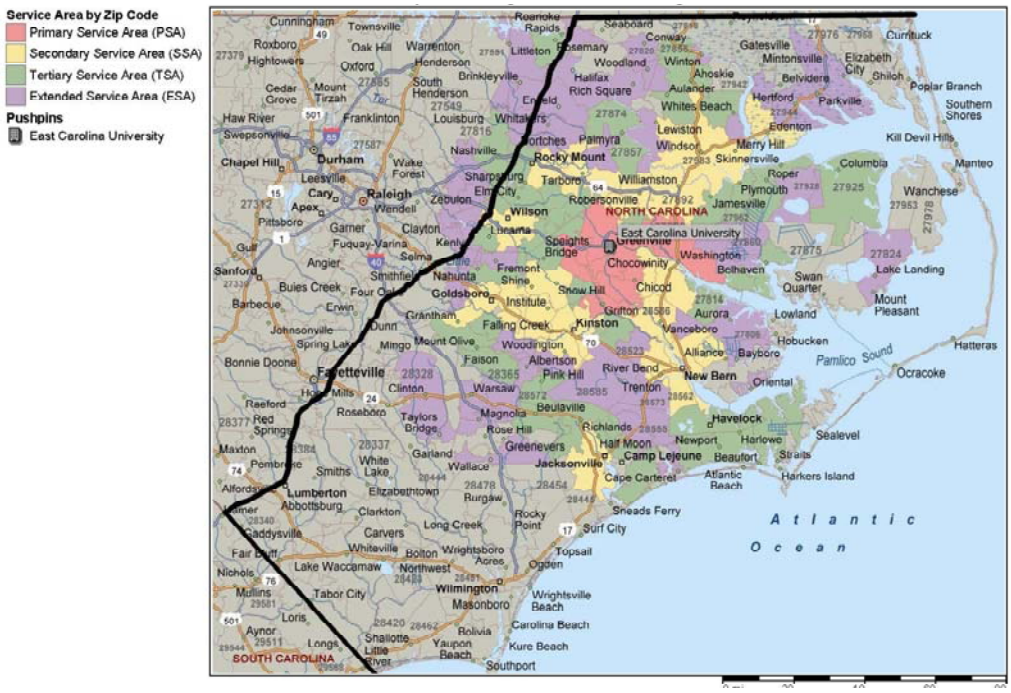
Table 1

Physician Type	Number of Physicians	Arrivals / Visits	Percent Distribution
Faculty	215	142,783	75.42%
Fellow	15	2,247	1.19%
Resident	208	44,295	23.40%
Total	**438**	**189,325**	**100.00%**

Source: ECU Data; assumes each visit is uniquely counted; i.e. no double counting of office visits to a patients physician type.

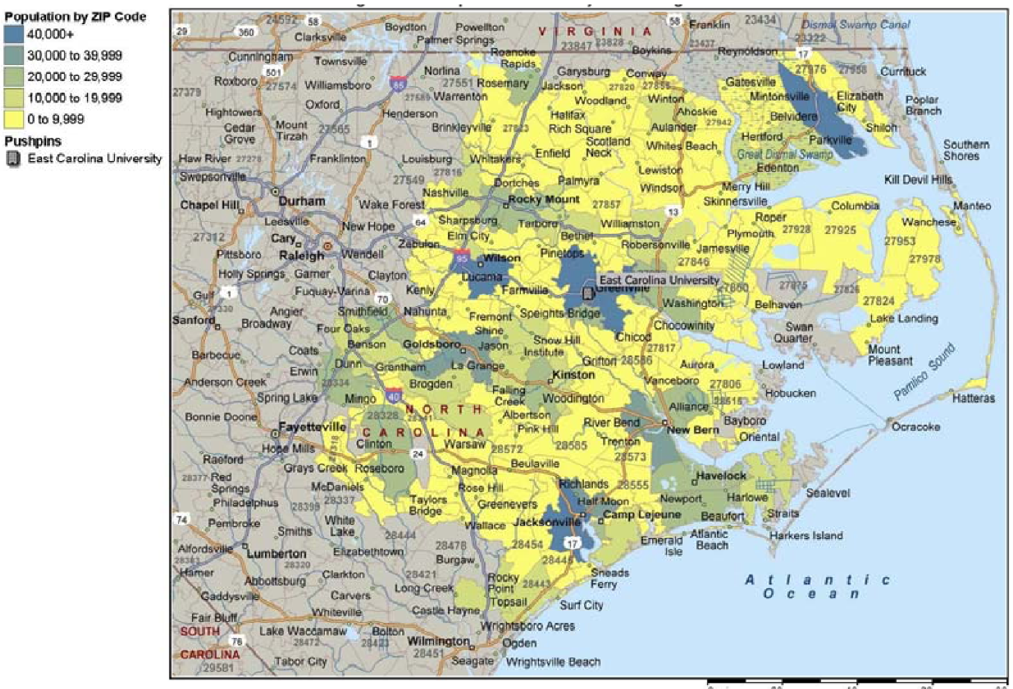
- The overall target market is shown on the graphic, Exhibit B.

Exhibit B – ECU Ambulatory Care Target Market



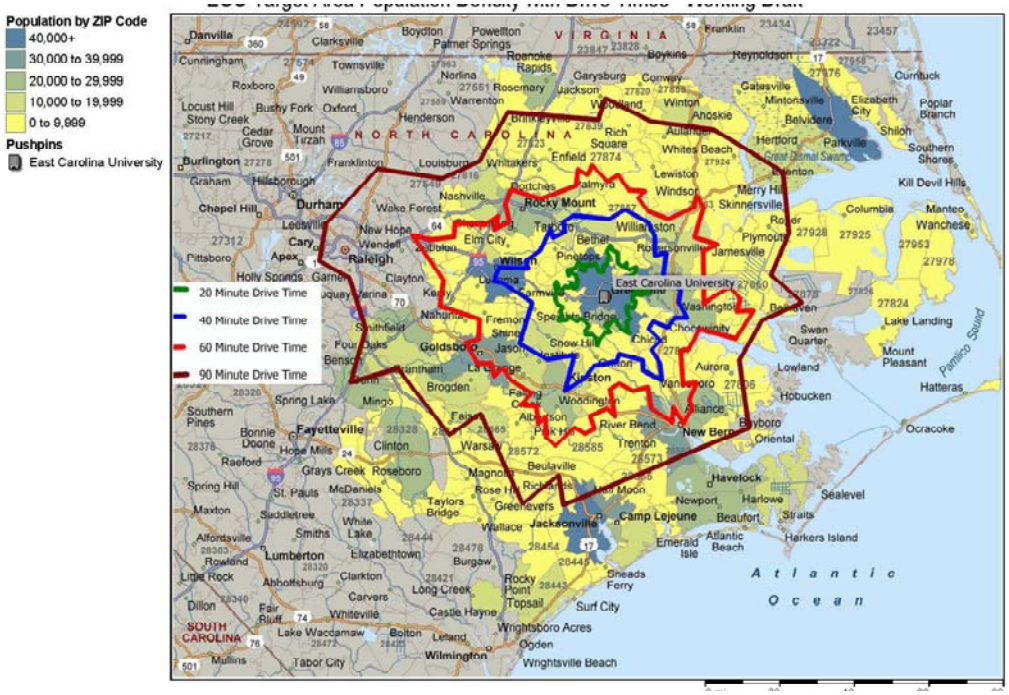
- The population density is shown on Exhibit C. Elizabeth City, Rocky Mount, Williamston, Wilson, Goldsboro, New Bern, Havelock, Clinton, Benson, and Jacksonville have population densities consistent with satellite program development.

Exhibit C – ECU Ambulatory Care Target Market Area Population Density



- Exhibit D indicates drive times from the Health Science Center Campus. Assuming a 40 – 60 minute drive time from Greenville, Rocky Mount, Williamston, Washington, New Bern, Kinston, Goldsboro, Wilson, and Rocky Mount appear to provide population densities which may support satellite program development.

  Exhibit D – ECU Ambulatory Care Target Market Area Population Density with Drive Times



- In general, the current Primary, Secondary, and Tertiary (PSA, SSA, TSA) Service Areas, as defined by this analysis, are within a 60-minute drive time from the Health Services Center Campus.
- As derived, the combined physician service area is somewhat smaller than that of the faculty physicians who, as expected, have a larger referral base. Exhibit E profiles the associated detail for the combined physicians and Exhibit F for the faculty physicians. This information is mapped on corresponding Exhibits G, H, and I. This data indicates:

  - ECU physicians have a relatively low market share approximating 10 – 15% in the PSA, 3 – 4% in the SSA, and approximately 2% in the TSA. There is room to grow market share.

  - The derived market opportunity approximates 2.7 to 2.9 million physician office visits in the combined PSA, SSA, TSA service areas. This is more than sufficient to provide sufficient patients for the Brody growth, assuming aggressive program growth and market intervention. Population increase, by itself, is not sufficient.

  - As mapped, and as can be expected, the relative market areas and share are consistent with roadway access to Greenville.

Exhibit E - ECU Combined Physician Visits Summary by Defined Service Area, July 2008 - June 2009

Service Area	2009 Population	Market Potential*	Arrivals / Visits	Market Opportunity	Market Share	Percent Distribution	Cumulative Percent
Primary Service Area (PSA)	205,087	628,797	96,689	532,108	15.38%	51.07%	51.07%
Secondary Service Area (SSA)	353,172	1,082,825	45,588	1,037,237	4.21%	24.08%	75.15%
Tertiary Service Area (TSA)	367,919	1,128,040	28,286	1,099,754	2.51%	14.94%	90.09%
Subtotal PSA, SSA, TSA	**926,178**	**2,839,662**	**170,563**	**2,669,099**	**6.01%**	**90.09%**	
Extended Service Area (ESA)	219,145	671,899	9,432	662,467	1.40%	4.98%	95.07%
Total All Service Areas	**1,145,323**	**3,511,561**	**179,995**	**3,331,566**	**5.13%**	**95.07%**	
Subtotal Other North Carolina			8,204			4.33%	99.41%
Total North Carolina			**188,199**			**99.41%**	
Subtotal Out-of-State			1,126			0.59%	100.00%
Grand Total			**189,325**			**100.00%**	

* Based on 3.066 average visits per person

Exhibit F - ECU Faculty Physician Visits Summary by Defined Service Area, July 2008 - June 2009

Service Area	2009 Population	Market Potential*	Arrivals / Visits	Market Opportunity	Market Share	Percent Distribution	Cumulative Percent
Primary Service Area (PSA)	221,498	679,113	71,930	607,183	10.59%	50.38%	50.38%
Secondary Service Area (SSA)	424,372	1,301,125	35,252	1,265,873	2.71%	24.69%	75.07%
Tertiary Service Area (TSA)	349,627	1,071,956	21,390	1,050,566	2.00%	14.98%	90.05%
Subtotal PSA, SSA, TSA	**995,497**	**3,052,194**	**128,572**	**2,923,622**	**4.21%**	**90.05%**	
Extended Service Area (ESA)	194,846	597,398	7,126	590,272	1.19%	4.99%	95.04%
Total All Service Areas	**1,190,343**	**3,649,592**	**135,698**	**3,513,894**	**3.72%**	**95.04%**	
Subtotal Other North Carolina			6,126			4.29%	99.33%
Total North Carolina			**141,824**			**99.33%**	
Subtotal Out-of-State			959			0.67%	100.00%
Grand Total			**142,783**			**100.00%**	

* Based on 3.066 average visits per person

- Exhibit G, indicates the defined services areas for ECU combined physicians, indicates some “gaps” between the defined Primary and Secondary service areas with potential development opportunities in areas such as Pinetops, Bethel, Speights Bridge, Vanceboro, and Snow Hill.

Exhibit G – ECU Combined Physician Service Areas

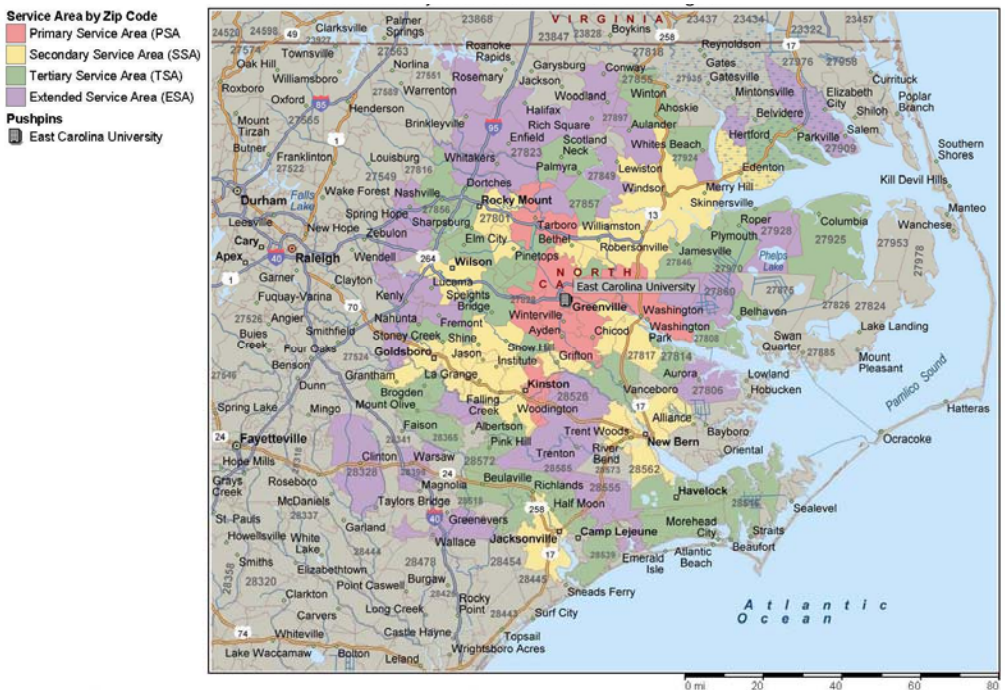


Exhibit H – ECU Faculty Physician Service Areas

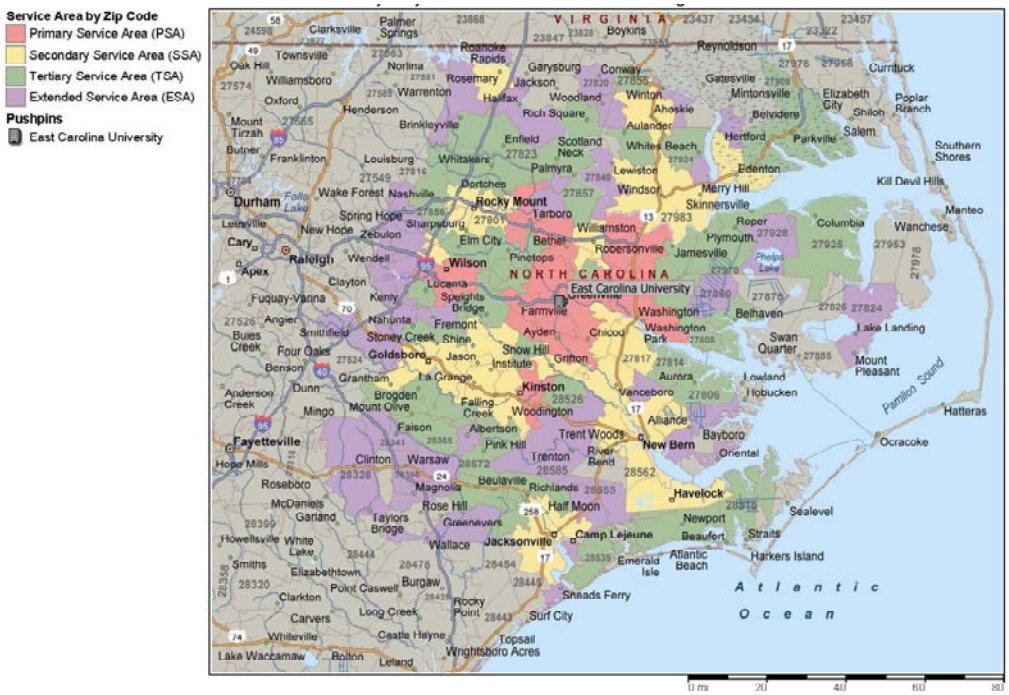
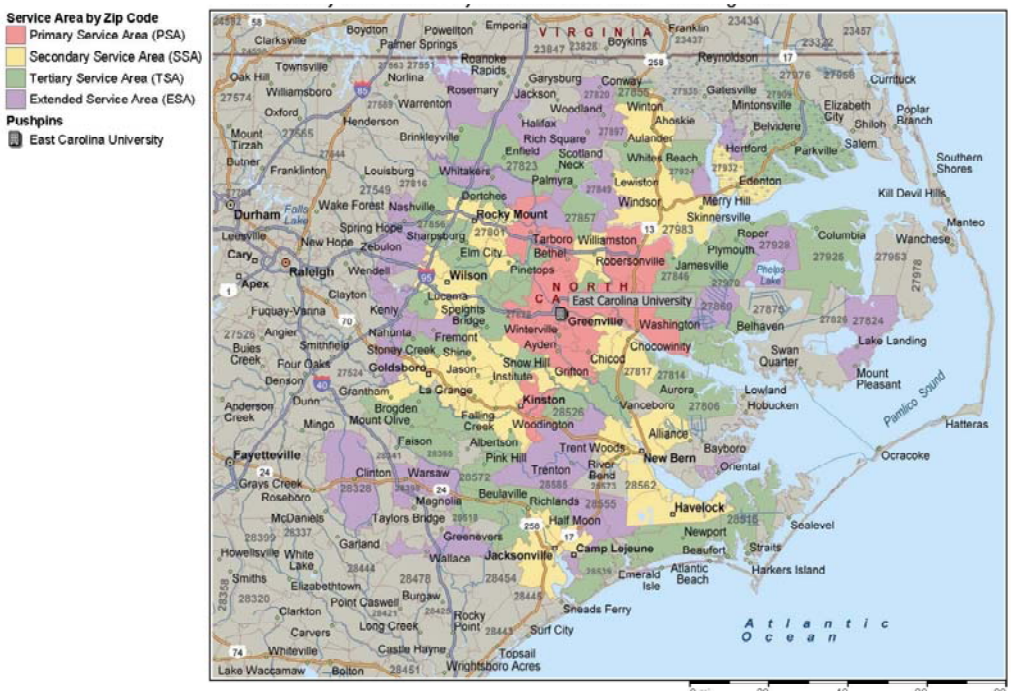


Exhibit I – ECU Faculty and Fellow Service Areas

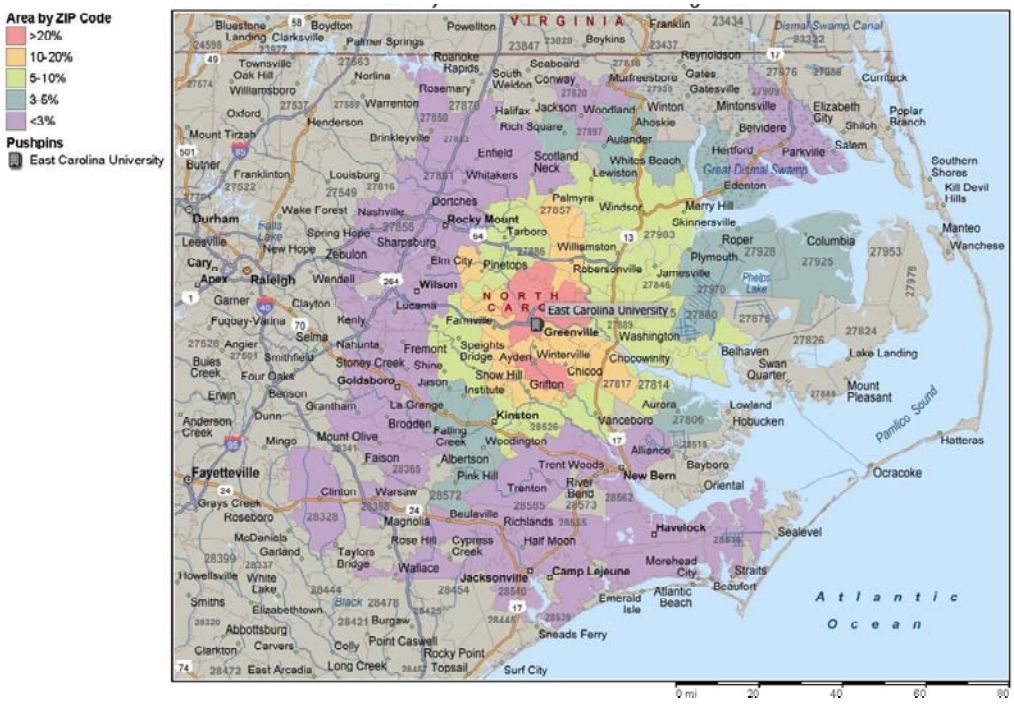


- Market share for the three physician categories are mapped on Exhibits J below. In general, they indicate:

  - A relatively "tight" service area as defined by drive times.

  - Market share "gaps" in areas such as Tarboro which could indicate potential development areas.

Exhibit J – ECU Combined Physician Market Share



Summary Conclusion

Brody School of Medicine, if it is to increase its class size by 50%, must develop programs which intercede in the market and which expand its market share in order to provide sufficient clinical experiences for its undergraduate (M3 & M4) and graduate (Fellows and residents) students. Regionally based satellite programs will be necessary. Faculty growth a prerequisite.

2025 volume and faculty growth projections represent a space need of 512,000 Building Gross Square Feet as detailed in Exhibit L below. Included in these area projections are assumptions for new (not yet identified) program growth including potential Allied Health and Nursing patient care settings as well as a projection for a new cancer center in an integrated facility. Not included in this area projection is population visits attributed to newly developed facilities (Cardiovascular and Family Medicine) nor Psychiatry which we assume benefits from a slightly off-campus location.

These projections also represent a total need for 3,370 cars using a population-based methodology.

Detailed, key room, assumptions are available in the Appendix.

Exhibit L – 2025 Aggregate Clinical Program Area

2025 PROGRAM (BASELINE)	# Key Rooms	DGSF	# Parking
CLINICS			
Sub-Total (Area @ DGSF)	142	107,100	
PROCEDURE SUPPORT			
Sub-Total (Area @ DGSF)	22	46,000	
IMAGING SUPPORT			
Sub-Total (Area @ DGSF)	28	35,600	
CANCER CENTER			
Sub-Total (Area @ DGSF)	21	29,900	
NON-INVASIVE D&T			
Sub-Total (Area @ DGSF)	15	18,500	
CLINICAL SUPPORT			
Sub-Total (Area @ DGSF)		21,500	
FACILITY SUPPORT			
Sub-Total (Area @ DGSF)		14,700	
TOTAL (Area @ BGSF)		**341,625**	**2,040**

6. Future Development Strategies

General Observations

Outpatient health care is delivered in at least 19 different locations on, or surrounding, the health sciences campus. Although recent investments in the Moye facilities, the Heart Center, the new Geriatrics facility, Family Practice facility and the clinics within the School of Allied Health have centralized their particular service lines they have, however, added to the fragmentation of the model of care. A bi-modal distribution has been developed with large concentrations to the north west and the north east. Wayfinding is circuitous and patient access and parking is dispersed. The health sciences campus may be characterized as low density and high land coverage.

Most of the older facilities do not support an integrated model of care delivery nor represent an appropriate ability to support flexibility of use or physical change. In general, these older facilities also represent higher maintenance requirements given that most were not built for ongoing institutional uses.

The newer facilities (Moye, Heart Center, etc.) also represent the newest systems built to a high level of facility performance.

Strategic Considerations

Healthcare facilities are strategic resources; they must be optimally responsive to foster clinical programs, enhance culture, optimize an educational mission and ensure efficient operations. They should enhance healthcare quality and safety and respond to technological change. Most important, they should be grounded in the development of appropriate clinical care delivery models and facility settings that optimize the use of finite resources.

The Continuum-of-Integration discussion earlier proposed that a semi-integrated, interdisciplinary model of education would best be supported by themed, interdisciplinary research across select schools and a care delivery model with the characteristics of a multispecialty group practice clinic. The types of clinical settings developed for a multispecialty care delivery model are different than those recently developed.

In addition, the clarity and level of clinical relationship with the major affiliated care provider (Pitt County Memorial Hospital) will drive program mixes, location and integration.

Aggregate Program Need

As discussed above, population and market share will result in an increase in arrived annual visits to credentialed faculty upwards of 422,000 by 2025; this represents a 52% aggregate growth in visits on the Health Sciences Center campus. Using a benchmark model based in contemporary operational models this growth results in an aggregate need for 142 specialty exam rooms for those populations not mapped to the Heart Center or the Family Practice Center. To support this aggregate population a total of 14 procedure rooms (both invasive and minimally invasive) are required; 28 imaging rooms and a complement of non-invasive diagnostic modalities will also be required. Cancer Center growth will drive 4 linear accelerators and 16 infusion positions. A total of 304 credentialed clinical faculty will need offices supported by conference capabilities and workspaces for sufficient departmental support, administrative personnel and fellows. This growth represents an aggregate total need for slightly over 340,000 BGSF and roughly 2,000 parking spaces (Faculty, Staff and Patient).

Exhibit M – Aggregate Program Need by Key Room Drivers

Clinical Program Need	**2020**		**2025**	
	# Key Rooms	**Area**	**# Key Rooms**	**Area**
CLINICS	116	87,400	142	107,000
Cardiovascular (in Heart Center)	-		-	
Family Medicine (in Family Medicine)	-		-	
Internal Medicine	18		24	
Ob/Gyn	8		12	
Oncology	18		24	
Pediatrics	20		24	
Psychiatry (Off Site)	-		-	
Rehab Medicine / PT	4		4	
Surgery	12		12	
Communication Sciences	6		6	
New Program Development	12		12	
Intake Center	10		12	
Wound Care Center	4		6	
Urgent Care Center	4		6	
DIAGNOSTICS & THERAPEUTICS	44	84,200	56	100,000
OR's + GI Suite	12		14	
Instrument Processing				
General Rad	4		6	
CT, PET/CT, MRI	6		6	
Nuclear Medicine	2		2	
US, Mammography	10		14	
EKG,EEG, ENG, ETC	8		12	
Pulmonary Function	1		1	
PT / OT Treatment, Human Movement	1		1	

	2020		**2025**	
	# Key Rooms	**Area**	**# Key Rooms**	**Area**
CANCER CENTER	16	28,300	20	30,000
Radiation Therapy	4		4	
Infusion	12		16	
Integrative Medicine				
CLINICAL SUPPORT		21,500		21,500
Clinical + Anatomical Lab				
Retail Pharmacy / DME				
Education - Patient + Student				
ADMINISTRATION & FACILITY		14,700		14,700
Admin / Business / Medical Records / PACS				
Building Support, Materials Dock				
Food Court				
CREDENTIALED FACULTY OFFICE	251	113,000	304	133,650
Cardiovascular (in Heart Center)	40		57	
Family Medicine (in Family Medicine)	45		64	
Internal Medicine	60		69	
Ob/Gyn	19		24	
Oncology	21		25	
Pediatrics	68		87	
Psychiatry (Off Site)	28		33	
Rehab Medicine / PT	10		12	
Surgery	36		42	
Communication Sciences	3		4	
Emergency	34		41	
GRAND TOTAL (DGSF)		349,100		406,850
GRAND TOTAL (BGSF) x 1.25		**436,375**		**508,563**
PARKING SPACES		2,700		3,370