Provider Supply Projection Method **Appendix A**

To project the relative supply of healthcare providers over the next 25 years, trends in physician and nonphysician supply over the past few decades were analyzed. Projections of demand for healthcare also were necessary to compute the availability of providers in North Carolina relative to the increasing population. These three projections—physicians, nonphysician clinicians, and demand—are discussed in turn below.

Physicians

The projection method for physicians was complex. There are multiple years of data on physician supply that include individual data on:

- physicians new to practice in North Carolina;
- physicians who cease practice in North Carolina;
- physicians recently completing residencies who practice in North Carolina;
- physicians recently completing undergraduate medical education who will eventually practice in North Carolina; and
- hours in direct patient care for licensed physicians in North Carolina (ie, the degree to which physicians in some age groups practice less than full time).

A baseline projection was made that assumed no changes in past patterns of entry and exit into practice in North Carolina. This involved the following steps:

1) Compute the number of active, nonfederal, nonresident physicians that practice in North Carolina by age and gender in 2004. Age is generally measured in one year increments.

2) Compute the annual percent change in the size of each age-gender cohort from 2000 to 2004. This captures the net effect of retirement and exit and entry into practice in North Carolina. For example, approximately 10% of male physicians aged 60-64 leave practice each year.

3) "Smooth" these transition rates by using regression methods to model change rates to be less variable across ages—for example, rather than a 10% growth for age 42 and 44 and a 5% decline for 43 year olds, smoothing might result in a 5% increase for all three ages. This smoothing improves the prediction power of the model by eliminating "lumpiness."

4) Calculate FTE-equivalent weights for each physician cohort by age/gender. This allows the projection to trend forward the productivity of physicians as they age as well as predict the productivity of new physician as they enter practice. For example, males 40-44 have the highest FTE equivalent while older and female physicians tend to work fewer hours per week in patient care. Thus, the projections move beyond counting "bodies" to count "potential patients consulted."

5) For each year subsequent to 2004,

   a) adjust the supply of physicians by the net growth rate in each age/gender group;

   b) age the workforce by moving the cohort in each group into the next older age group; and

   c) calculate the FTE equivalent based on age/gender cell size.

After the baseline projection is made, theoretical policy options can then be modeled. A number of policy options have been formally modeled. The first is an expansion in the size of the education pipeline (both UME and GME). Using historical patterns of physician location and sizes of training programs, there is an annual net increase of roughly 480 physicians who are trained in North Carolina (either at medical school or residency) and eventually practice in North Carolina. This increase is incorporated in the baseline model via the net growth rate. A 30% increase in education throughput, for example, would add an additional .3 * 480 or 114 physicians per year to the North Carolina supply. The increases are timed to account for the delay after implementation until increases are realized. That is, a 30% increase in 2007 assumes those physicians who were first-year residents in 2007 enter the NC workforce in 2010 and those physicians who were first-year medical students in 2007 enter the NC workforce in 2014.

The second theoretical policy option is an increase in the number of physicians who migrate into North Carolina. The average number of "new-to-file" physicians is calculated by age/gender group for the past five years. The net increases due to students and residents are netted out to leave only those physicians who are currently practicing elsewhere. Presumably most are practicing elsewhere in the United States. This serves as the baseline recruitment influx to which an increase in the recruitment rate is applied. For example, there is an average of 104 new-to-file 40-44 year old male physicians annually. A 20% increase in recruitment would increase the net supply by .2 * 104 or 21 per year. These are allocated uniformly across the five ages in the group, so a 20% increase would increase the number of 42 year old physicians by about 4 (20% * 104 /5 years in the 40-44 age group).

Nonphysician clinicians

Projections for nonphysician clinicians (NPC)—Certified Nurse Midwives (CNM), Physician Assistants (PA), and Nurse Practitioners (NP)—were more straightforward than projections for physicians due to more limited data and historical labor supply patterns. Multiple projection methods were attempted; many theoretically reasonable approaches did not yield results with face validity (eg, a 300% increase in NPC supply). The age pyramid method used for physicians was not considered due to the variability of supply trends associated with the smaller number of providers in these three groups. CNM growth was deemed reasonable since 2000—a net increase of about 7 per year. Some members of the Steering Committee deemed the growth in NPs and PAs over the 2000-2004 time frame as an aberration that would not be sustained in the long run; they advocated using average growth since 1979. Other members expected the recent growth to continue. In the end, projections

were performed using both averages. Recent growth is deemed "high" growth, and historical growth is classified as "low" growth. Users of the projection spreadsheet (see below) can chose which growth they would like to assume.

Combining NPC and physicians is problematic since there are multiple "FTE Physician" equivalents used for NPCs. Ultimately, the choice of FTE weight represents the degree to which a NPC can "substitute" a physician. Although there are widely varying opinions on this matter, two alternative weights were used here. The Health Resources and Services Administration uses .5 for NPCs when calculating provider supply when designating Health Professional Shortage Areas. This served as the default weight. Given that new models may increasingly shift primary care to NPCs, this FTE weight may be low; in this analysis we also used .75 as an alternative estimate to test for sensitivity. Again, users of the projection spreadsheet can choose which FTE they would like to use (or specify their own, for that matter). Furthermore, users can specify an assumed growth in education throughput.

Population

As outlined in the report, there are three factors likely to lead to an increase in the demand for healthcare services. The population is increasing, the population is getting older, and the prevalence of chronic disease is increasing. Estimates of the first two were obtained from NC State Demographer population projections out to 2029—projections to 2030 assumed the rate of growth from 2028 to 2029 would apply to 2029 to 2030. The effect of aging was determined by calculating the average number of office-based physician visits for the national population in 2002 (Medical Expenditure Panel Survey) and applying the same rate to each age cell in subsequent years. Note that this is likely an underestimate—other data show that the average number of visits per age group grew considerably from 1990 to 2004,[a,b] at least partially due to increasing chronic disease burden. There were some attempts to estimate the effect of increasing chronic disease on demand for healthcare services. Net increases (over and above the effect of population growth and aging) were in the single digit range; the method was deemed insufficiently tested to be included in this report. Thus, we mention the potential magnitude of, but do not formally include, chronic disease as a driver of projected demand.

Productivity

New healthcare delivery models were of great interest to the Steering Committee. With little empirical evidence to guide estimation of the net effect of new models on the demand for healthcare services, productivity factors were used to inflate the effective supply of providers. Thus, a 10% increase in productivity would increase the number of effective providers from 20,000 (for example) to 22,000. Again, the user can incorporate these assumptions into the model.

a Hing E, Cherry DK, Woodwell DA. *National Ambulatory Medical Care Survey: 2004 Summary*. Number 374. Hyattsville, MD: National Center for Health Statistics; 2006. Available from: http://www.cdc.gov/nchs/data/ad/ad374.pdf.

b Schappert SM. *National Ambulatory Medical Care Survey: 1990 Summary*. Number 213. Hyattsville, MD: National Center for Health Statistics