

Developing Healthy, Happy, and Productive Young Adults:

The North Carolina Metamorphosis Project and the NCIOM Task Force on Adolescent Health

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The health and well-being of adolescents has a tremendous impact on the overall health of North Carolinians: the youths of today are tomorrow's workforce, parents, teachers, and leaders. Ensuring that youths find a way to successfully navigate adolescence is of critical importance not only to their health and well-being but also to the economic growth of our state. Unfortunately, data show that far too many of our youths are not as healthy as they could be. For example, a survey conducted in 2009 revealed that over one-half of high school students were not as physically active as they should be, over one-third used alcohol in the past 30 days, and approximately one-fifth felt they were "alone in life."¹ Although North Carolina has a long history of investing in the health and well-being of its children, less has been done to ensure that its adolescents develop into healthy, productive adults.

The North Carolina Institute of Medicine (NCIOM) Task Force on Adolescent Health

The North Carolina Multidisciplinary Adolescent Research Consortium and Coalition for Health (NC MARCH) recognized the need for a more coordinated plan to address the health and well-being of adolescents. With funding from The Duke Endowment, NC MARCH created the North Carolina Metamorphosis Project (NCMP) to study ways to improve the health and well-being of the state's adolescent population. The NCMP is a collaborative effort by the University of North Carolina at Chapel Hill (UNC-CH) School of Medicine and Gillings School of Global Public Health, NC MARCH, the NCIOM, the North Carolina Division of Public Health, and Action for Children North Carolina. The NCMP consists of three distinct projects: an adolescent health

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portrait, a survey of parents, and a task force on adolescent health (the portrait and the survey findings are available at: <http://www.med.unc.edu/ncmp>). The NCMP asked the NCIOM to convene the task force.

The NCIOM Task Force on Adolescent Health was cochaired by Steve Cline, DDS, MPH, former deputy state health director, Division of Public Health, North Carolina Department of Health and Human Services (NC DHHS), and assistant secretary for health information technology, NC DHHS; Carol Ford, MD, original principal investigator, NCMP, and past associate professor, School of Medicine and Gillings School of Global Public Health, UNC-CH; and Howard Lee, executive director, North Carolina Education Cabinet. There were 38 other members of the Task Force, which met 12 times from May 2008 through September 2009. A list of task force and steering committee members appears at the end of the text.

The task force made 32 recommendations in its report²; 10 were deemed especially important and were designated as priority recommendations. Priority recommendations are presented here in bold.

Focus on Developing Youths

Adolescence is a time of rapid change that involves dramatic shifts in physical, cognitive, and emotional development. Additionally, adolescents' social relationships are in constant flux as they work to develop a sense of their role in the world. External influences, including peers, parents, educators, clinicians, and community members, help drive the transition from childhood to adulthood. In the policy forum of this issue, Daniel Krowchuk³ discusses adolescent development and transition.

Traditionally, efforts to improve the health and well-being of youths have focused on preventing harmful behaviors. However, preventing harmful behaviors is only part of the equation to ensure that adolescents are prepared for adulthood. In preparing for adulthood, youths must also receive the support, relationships, experiences, resources, and opportunities necessary to become healthy, successful adults. Just as parents focus on preventing harmful behaviors and providing support, so too must educators, health care professionals, policymakers, and others who influence youth development. We must work to reduce risky behaviors, identify the resources that adolescents need to succeed, and ensure that all adolescents have those resources. Reframing the way we think about and how we address adolescent health issues is the key to developing a successful approach. If we are to improve the health and well-being of our youths, we must view young people as resources to be developed, rather than as problems to be solved.⁴ In this issue of the *NCMJ*, Michael Resnick⁵ discusses why this paradigm shift toward youth development is critical to improving the health and well-being of our young people.

The task force embraced this approach as they worked to develop a roadmap for improving the health and well-

being of North Carolina's youths. Instead of focusing solely on *prevention*, the task force also looked at ways to *invest* in young people so they can *develop* the skills and attributes needed to become productive adults. Everyday hundreds of thousands of North Carolina adolescents are trying to make the right choices; the task force identified strategies to support adolescents in making decisions to support their best aspirations.

When thinking about youths as resources to be developed, it is critical to identify what parents and policymakers hope for North Carolina youths and what they hope for themselves. When parents talk about their dreams for their children, they do not say "I want my child to be smoke free, substance free, and mentally healthy." Instead, they express hope that their children will be healthy and happy with a

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family and a successful career. Policymakers must do the same by envisioning their goals for young North Carolinians and putting in place the services and support that can help youths reach these goals. This work should be done with input from parents and youths themselves. In this issue, Dale Galloway⁶ discusses the importance of parent involvement in improving the health and well-being of all children in the community, Lee Storrow⁷ shares his perspective on why it is important that policies about youths are not made without their input, and Kristen Ito and Jane Brown⁸ explore ways to use new media to involve youths in their own care.

For the well-being of our state, it is important that adolescents are well-prepared for the challenges of adulthood and become healthy, productive members of society by entering the workforce, forming families, raising children, and becoming tomorrow's leaders. To do these things well in the 21st century requires that youths are not only healthy but also well-educated and prepared for life's challenges. The task force recognized the importance of health and education in the current and future well-being of youths and worked

to identify the investments needed to improve outcomes in both areas.

Strengthening Adolescent Health Care

Adolescence is typically a time of robust physical health. Findings from a national survey conducted in 2007 revealed that individuals aged 10 to 20 years had lower average annual health care costs, with fewer admissions to the hospital, visits to the emergency department, and visits to a physician's office than people in other age groups.⁹ Youths who are healthy are more likely to be successful in school. There is mounting evidence that students who have nutritionally sound diets, are physically active, spend time in stress-reducing environments, avoid risky behaviors, have beneficial school connections, and experience nurturing relationships with adults have improved school attendance, behave better in class, and perform better on standardized tests.¹⁰ The greatest threats to the health and well-being of adolescents are the choices they make about health-compromising behaviors. Adolescents are no longer at risk for the adverse health conditions associated with early childhood and have not begun to experience the declines in health seen during adulthood. However, death and disability rates double between the time students leave elementary school and enter the workforce, primarily because of an increase in the frequency of risk-taking behaviors.¹¹ Health-compromising decisions made during adolescence can have both short-term and long-term effects on health. Similarly, many of the behaviors and health habits that affect lifelong health trajectories are established during adolescence.

Adolescents need support—at home, at school, in clinics, and in the community—to help them develop the skills and knowledge needed for their health to flourish now and into adulthood. Regular preventive check-ups and counseling can help ensure that adolescents develop patterns of behavior that will favorably influence lifelong trajectories of health and provide opportunities for early diagnosis and intervention when problems emerge. In this issue, Carolyn Sexton and colleagues¹² explain how the new Adolescent Health Check package from the North Carolina Division of Medical Assistance will help improve the quality of adolescent health. In addition to improving clinical care in traditional delivery models, supporting and expanding health services are important strategies for ensuring that more adolescents have access to health care. **Therefore, the task force recommended that North Carolina strengthen and expand school-based and school-linked health services in middle and high schools.** Steve North and Constance Parker¹³ discuss school-based and school-linked health centers, their implementation in North Carolina, and what can be done to strengthen and expand successful models in our state.

Improving Educational Outcomes

A high school diploma was once a means to a better job, but today a high school diploma is a prerequisite for success in

the job market.¹⁴ The future success of North Carolina's economy depends on the presence of a well-educated populace. However, approximately 30% of North Carolina high school students each year do not graduate.¹⁵ In North Carolina, each class of dropouts is estimated to lose more than \$10 billion in lifetime earnings.¹⁶ Although the loss of income has an enormous impact on the lives of these individuals and their families, it is also felt by the state and communities. The economic and social costs of high school dropouts are staggering. In addition to lost tax revenue from lower earnings, states with a less educated populace have more difficulty attracting business investments and spend more on social programs and crime prevention.

In addition to improving individuals' economic prospects, research increasingly shows that education and health outcomes are tightly intertwined with success in school. People with more years of education are more likely to live longer, healthier lives.¹⁷ Therefore, targeted investments in the public education system of North Carolina have the potential to improve academic performance and increase education duration, yielding a more educated workforce, enhanced economic development, and improved long-term health outcomes. **Therefore, the task force recommended that North Carolina strengthen and expand efforts to support and further the academic achievement of middle and high school students, with the goal of increasing the high school graduation rate.**

Preparing Youths for Adulthood

In addition to needing health care and a high quality education, youths need to learn healthy behaviors and continue them into adulthood. As they transition from childhood to adulthood, adolescents increasingly make decisions that affect their current and future health. During adolescence, youths need guidance and education about the importance of healthy behavior, the impact of various decisions on their health, and the steps they can take to ensure better health today and in the future. Parents and clinicians are two sources of this information, and schools are a third. To ensure that, as part of the North Carolina Division of Public Instruction's stated mission, our students are prepared for life in the 21st century, schools must provide students with the knowledge and skills needed to become healthy, responsible adults.

The North Carolina Healthy Schools partnership between the Department of Public Instruction and the NC DHHS promotes the union of health and learning in public schools, using a coordinated school health approach.¹⁸ The partnership is funded by the Centers for Disease Control and Prevention (CDC) to provide a coordinated and integrated approach to improving the health and well-being of our schools and students that, in turn, improves academic achievement.

The CDC has identified eight critical elements that should be included in a coordinated school health approach:

health education, physical education, health services, nutrition services, mental and behavioral health services, healthy school environment, health promotion for staff, and family and community involvement.¹⁹ Research has shown that well-executed components of the coordinated school health approach have a beneficial effect on students' chances for academic success.²⁰ Supporting and strengthening the Healthy Schools partnership is critical to improving health programs, policies, and services in schools. **Therefore, the task force recommended that the state ensure implementation of the coordinated school health approach and expansion of the North Carolina Healthy Schools partnership to include a local healthy schools coordinator in each local education agency.**

The Broader Context of Youth Development

Research shows that the social contexts in which adolescents are embedded heavily influence their decisions. The task force used a socioecological model of the influences on the health and well-being of young people that recognizes that youths are influenced by personal preferences; family, friends, and peers; health care professionals; the broader community in which they live, attend school, and work; and public policies (Figure 1).

The relationships in the socioecological model are multi-directional; each level influences the other levels. For example, youths influence and are influenced by their friends and peers. Many individuals, working together, can influence public policies, and public policies can have a strong influence on the community and environment. As a result of this interconnectedness, interventions and strategies that address multiple levels are generally the most effective.²¹ To maximize effectiveness, public health interventions should be offered at all levels of the socioecological model (ie, schools, communities, and clinical settings), target people who interact with youths (eg, families and peers), and be reinforced through supportive public policies

Improving Program Quality

The task force sought to identify policies, programs, and services that have the greatest likelihood of producing good health outcomes, either through improvements in health-promoting behaviors or reductions in risk factors. The task force recommended the use, when possible, of evidence-based strategies. Strategies are considered to be evidence based if they have been scientifically proven to improve specific health outcomes and healthy

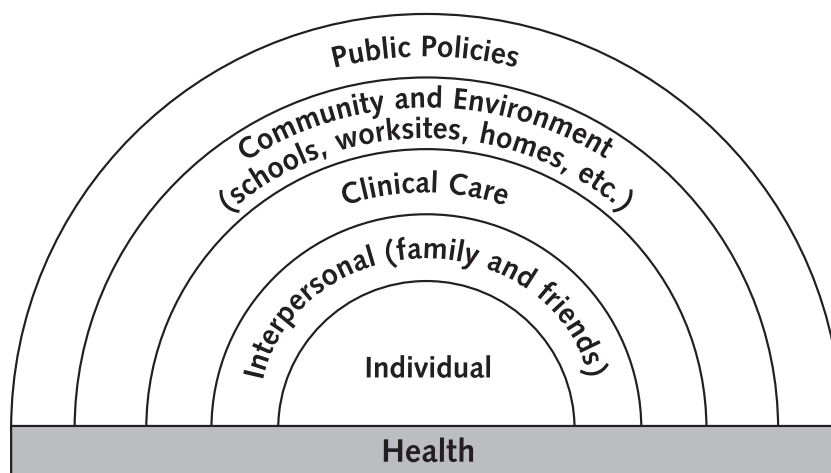
development across multiple adolescent populations. Given the current economic climate, in which funding is limited, investment in strategies that are supported by strong evidence is, in general, a more efficient use of funds. **Therefore, the task force recommended that the North Carolina agencies involved in funding adolescent health initiatives place a priority on supporting evidence-based programs that address behaviors across multiple domains and that account for the racial, ethnic, cultural, geographic, and economic diversity of the population being served.**

In this issue of the *NCMJ*, Lewis Margolis and colleagues²² discuss key components of evidence-based programs, and Michelle Hughes²³ summarizes the role of implementation support in ensuring their quality delivery. Representative Susan Fisher²⁴ reviews the importance of stakeholder involvement and cost in the development of legislation that supports program implementation, and Lindsey Haynes and Anne Hardison²⁵ explore the challenges of implementing evidence-based programs in real-world settings.

Reducing Health Compromising Behaviors

In addition to ensuring that young people are healthy and well educated, which are protective against poor outcomes, the task force considered strategies to reduce factors that place youths at risk for adverse health. As discussed above, the greatest threats to the health and well-being of adolescents are the choices they make about health-compromising behaviors such as smoking, drinking, and committing acts of violence. The task force used the work of the CDC to identify health-compromising behaviors prevalent among adolescents. In setting the Healthy People 2010 goals, the CDC identified 21 critical health objectives for adolescents and young adults.²⁶ The task force worked to identify strate-

Figure 1.
Socioecological Model of Health



Note. Adapted by the North Carolina Institute of Medicine Task Force on Adolescent Health¹ from the original by Glanz and colleagues.²¹

gies to reduce risks for each of the health areas identified by the CDC, including unintentional injury, substance use and abuse, mental health, violence, sexual health, and chronic illness.

Preventing Unintentional Injuries

Unintentional injuries are the leading cause of death and disability for North Carolina youths aged 10 to 20 years.^{27,28} The majority of unintentional injuries are preventable, whether due to motor vehicle crashes, sports injuries, falls, poisoning, or other events. Motor vehicle crashes are the most common cause of unintentional injuries in this age group, accounting for almost one-half of all deaths and resulting in the greatest number of injury-related hospitalizations.²⁷ Younger, more inexperienced drivers are more likely than drivers of any other age to be involved in a motor vehicle crash.²⁹

North Carolina is a national leader in implementing evidence-based policies to reduce the incidence of motor vehicle crashes involving young drivers. The state has a graduated system in place for licensing drivers, primary seat belt laws (which allow law enforcement officials to stop vehicles containing people without a seatbelt), high-visibility enforcement of existing traffic laws, and a zero blood-alcohol-concentration limit for adolescents, all of which have contributed to a reduction in rates of motor vehicle crashes involving young drivers.²⁹

One resource in North Carolina that could be further developed is the driver-education program in public schools. North Carolina is one of the few states that fully funds driver education in the school system. However, although driver education helps train new drivers, these programs have not reduced young drivers' crash rates, and the characteristics of a high-quality driver-education curriculum are unclear. Given North Carolina's strong history of implementing evidence-based preventive policies and programs in this area, it has the unique opportunity to further its leadership and develop an evidence-based driver-education curriculum. **Therefore, the task force recommended that the North Carolina Department of Transportation should develop, implement, and evaluate a driver-education pilot program in the schools.**

Improving Mental Health and Reducing Substance Use and Abuse Among Adolescents and Young Adults

Although most youths successfully navigate adolescence without significant psychological, social, or health problems, adolescence is a period when threats to mental and physical health increase and lifelong mental health problems may begin or emerge.³⁰ National data show that at least 20% of children and adolescents have a mental disorder (eg, depression, attention-deficit/hyperactivity disorder, anxiety, and eating and behavioral disorders) and that at least 10% have a serious emotional disturbance (ie, any mental

health disorder that causes a severe disruption in daily functioning).³¹ Adolescents with symptoms of mental illness are more likely to have academic or social problems in school, to be expelled or suspended, to become pregnant before adulthood, to be convicted of a crime, to experiment with alcohol and illegal substances, and to commit suicide.^{32,33}

Many youths begin experimenting with drugs and alcohol during adolescence. Nationally, the use of drugs and alcohol is highest among adolescents and young adults, with drug use peaking at ages 18 to 22 years and alcohol use peaking at ages 21 to 24 years, when consumption of alcohol becomes legal.³⁴ Approximately 7% of adolescents aged 12 to 17 years and 20% of young adults aged 18 to 25 years in North Carolina reported alcohol or illicit-drug dependence or abuse during 2006-2007.³⁴ The early use and misuse of alcohol and drugs can lead to later abuse and addiction; repeated use has also been shown to affect learning and memory, which can lead to poor performance in school. Furthermore, use of alcohol or other drugs is strongly linked to other risky behaviors.

Unfortunately, the majority of cases of mental illness and substance abuse among adolescents go unrecognized or untreated, leaving youths vulnerable to diminished academic performance and to social and behavioral impairments during this critical phase of development.^{34,35} **To address these issues, the task force recommended that the state ensure the availability of substance abuse and mental health services for adolescents.**

Violence

Youth violence affects both young people and society overall. The costs of youth violence, including isolation, loss of income and social capital, and imprisonment, are borne by the victim, the perpetrator, their families, and communities at large. Additionally, individual victims of youth violence may experience adverse physical and/or psychological outcomes, as well as increased risk for future problematic behavior.³⁶ A recent national survey found that 70% to 80% of youths aged 10 to 17 years experienced some type of victimization (eg, maltreatment, including physical and sexual assault, and property damage) in the past year.³⁷ Most youths reported they were physically assaulted without injury by a sibling or peer, and slightly more than 10% reported maltreatment by an adult. In addition to high rates of personal violence, respondents reported high rates of community and family violence. It is difficult to get an accurate representation of the number of youths affected by violence in North Carolina, because of varying definitions, a wide variety of data sources, and inconsistent data.

Reducing youth violence requires a community-wide effort that involves individuals, families, schools, and government agencies in school and nonschool settings. There are several evidence-based programs that target violence directly and indirectly, by addressing the risky behaviors that contribute to violence. Although it is important to

implement these programs for all youths, using evidence-based programs and services is especially critical when targeting at-risk youths, to ensure the best outcomes possible. Juvenile Crime Prevention Councils make decisions at the local level about funding for community sanctions (ie, alternatives to incarceration) and community-level programs to prevent delinquency and substance abuse. **Therefore, the task force recommended that the Department of Juvenile Justice and Delinquency Prevention strongly encourage Juvenile Crime Prevention Councils to fund evidence-based juvenile justice prevention and treatment programs.** It is also important to note that recommendations about funding the evidence-based programs in schools and communities that were discussed above will also help reduce youth violence and delinquency.

Reducing Teenage Sexual Activity and Preventing Sexually Transmitted Diseases and Teenage Pregnancies

During adolescence, many youths begin to have romantic relationships and explore their sexuality. This is a healthy and necessary part of adolescent development and is an important step toward the emergence of the adult role of forming families. However, this exploration can lead youth to engage in health-compromising behaviors that expose them to psychological and emotional risk, as well as to sexually transmitted diseases (STDs) and pregnancy. North Carolina data show that more than 20% of 9th graders and more than 50% of 12th graders report having had sex in the past month.¹ The state's birth rate among teenagers aged 15 to 19 years is one of the highest in the nation (50 births per 1,000 teenagers, compared with the national rate of 42 births per 1,000 teenagers), and nearly one-half of all new STDs in North Carolina occur among people aged 15 to 24 years.^{38,39} Abstaining from sexual contact is the only method that can prevent these outcomes. If adolescents are sexually active, the best ways to reduce the risks of unwanted pregnancy and STDs, including human immunodeficiency virus (HIV) infection, are to use condoms during sex and to minimize the number of sexual partners.

The CDC recommends a multifaceted approach for reducing adolescent involvement in risky sexual behaviors, including promoting abstinence, helping youths who have been sexually active return to abstinence, and educating youths who are sexually active in the correct and consistent use of condoms. North Carolina made an important step toward providing such an approach in 2009 when the state's General Assembly changed North Carolina's reproductive health and safety education from an abstinence-only curriculum, which has not been proven to be effective, to an evidence-based curriculum. There are many other programs to help reduce teenage pregnancies and STDs across the state. Kay Phillips⁴⁰ discusses one innovative new program that uses technology to meet teenagers' needs. To support and complement the programs and services that are already

in North Carolina and to get closer to the multifaceted approach recommended by the CDC, **the task force recommended that North Carolina develop and disseminate a social marketing campaign to prevent unintended pregnancy, expand the Teen Pregnancy Prevention Initiative, and add other STDs to the HIV-associated Get Real. Get Tested. campaign in order to reach more adolescents.**

Chronic Disease Prevention

The health behaviors and habits developed during adolescence affect lifelong health trajectories. Although most adolescents are healthy, almost 50% of American adults have at least one chronic disease (eg, diabetes, high blood pressure, and hypertension).⁴¹ The incidence of adult cardiovascular disease (eg, heart attack and stroke), including early onset adult cardiovascular disease, is particularly high in North Carolina. Early targeting of behaviors that lead to chronic disease, such as the risky health behaviors the task force studied, is critical to preventing or delaying the onset of these diseases. Although there are many behaviors that impact chronic disease, the task force focused on tobacco use and obesity. The underlying behaviors commonly leading to each condition often develop during adolescence and are leading causes of adult chronic and cardiovascular disease.

Tobacco use is a major risk factor for cardiovascular disease and contributes to over 30% of cancer deaths and more than 90% of lung cancer deaths.^{42,43} Almost all adults who smoke became addicted to tobacco during adolescence.⁴⁴ In 2009, 25% of North Carolina high school students reported any tobacco use.⁴⁵ Over the past eight years, North Carolina foundations, governmental entities, health care professionals, insurers, and other community partners have worked together to implement a multifaceted, evidence-based campaign to reduce tobacco use among young people. The campaign has included evidence-based interventions to change social norms, affect clinical practice, improve the community and environment, and strengthen public policies. This multifaceted effort has helped decrease the prevalence of youth smoking by 30% (absolute decrease, 8%) between 2003 and 2007.⁴⁶ Although North Carolina has made great strides, far too many youths still use tobacco products. **Therefore, to further reduce tobacco use, the task force recommended that the state support the full implementation of North Carolina's tobacco control program.**

Being obese or overweight is a major risk factor for cardiovascular disease. Obese and overweight youths are at increased risk for developing high blood pressure, high low-density lipoprotein (ie, "bad cholesterol") levels, and type 2 diabetes during adolescence and later on in life. According to Trust for America's Health and the Robert Wood Johnson Foundation, North Carolina youths aged 10-17 years had the 14th highest prevalence of overweight and obesity in the country during 2007.⁴⁷ Compared with tobacco use, obesity is a much more complex problem that is affected by a

number of factors, including physical activity, nutrition, diet, genetics, metabolism, and the environment. To reduce rates of obesity and overweight among youths, the CDC recommends reducing caloric intake, eating healthier foods, and becoming more active.⁴⁸ These changes can and should be undertaken and supported at all levels—family, school, community, and state. The school food environment is one area in which a huge difference can be made. **To promote healthy eating and reduce overweight and obesity, the task force recommended that North Carolina funders provide financial support to test and evaluate innovative strategies to deliver healthy meals in middle and high schools.**

Mobilizing to Develop All Youths

The task force report was released at the North Carolina Adolescent Health Summit on December 15, 2009, in Chapel Hill, North Carolina.² That meeting brought together more than 200 policymakers, advocates, clinicians, school professionals, parents, youths, and other interested persons who want to ensure that all North Carolina youths have the kinds of opportunities and support needed to become successful adults. In their article, Mark Holmes and Carol Ford⁴⁹ discuss the next steps in implementing the recommendations of the task force. On the basis of work accomplished at the summit, many groups have already started to mobilize around this roadmap for improving the health and well-being of our youths. To improve the lives of adolescents, we must continue to rally young people, parents, and leaders in our communities around this common theme of developing North Carolina youths to their fullest potential. **NCMJ**

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