

# **Women, Tobacco, and Cancer:** ***An Agenda for the 21st Century***

July 2004

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
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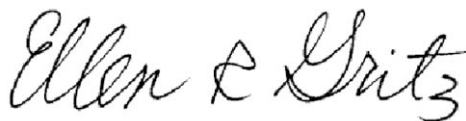
## From the Leadership

We are very pleased to submit the Report of the Women, Tobacco, and Cancer Working Group. Currently, in the United States, 170,000 women die each year from smoking, and lung cancer has surpassed breast cancer as the leading cause of cancer death in women since 1986. The burden of tobacco use is especially high for certain populations of women, including women with low levels of education and in certain ethnic groups, such as American Indians. Ominously, rates of tobacco use are rising among women in economically developing countries, where women's tobacco use has traditionally been very low. Despite this, tobacco use has not generally been considered a "women's issue."

The 2001 Surgeon General's report, *Women and Smoking*, presented a comprehensive overview of the health effects of smoking on women and girls, and provided a framework and direction on what is needed to reduce smoking. The Working Group builds on the Surgeon General's report by articulating a set of strategies in five areas: discovery, development, delivery, partnerships, and evaluation and surveillance.

This Report represents the collaborative efforts of the dedicated scientists, clinicians, and advocates who participated in the Working Group. We believe that it is possible to reduce and ultimately eliminate tobacco use and tobacco-caused disease in the United States and abroad. With sustained, focused efforts that include partnerships and collaborations among researchers, practitioners, community advocates, and policy makers, we can implement these recommendations and help make this goal a reality.

Respectfully,



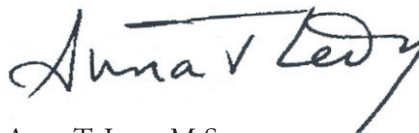
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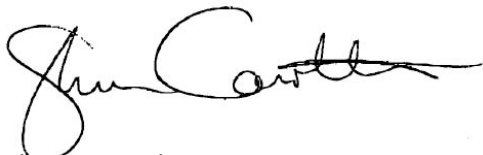
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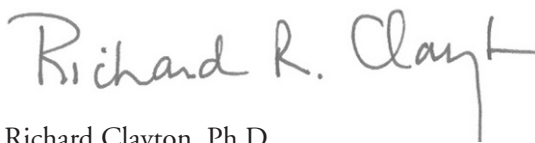
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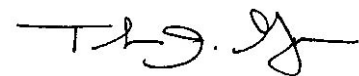
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# Executive Summary

For far too long, tobacco use has been viewed as a men's issue, but the use of tobacco among women around the world is now common. As a result, women have experienced a dramatic upsurge in cancers, cardiovascular and lung disease, and other life-threatening conditions caused by tobacco use. Currently, it is estimated that approximately 1 in 5 U.S. women smoke and 170,000 U.S. women die each year from smoking.

The 2001 report of the Surgeon General, *Women and Smoking*, identified several strategies to reduce smoking among women. In addition, in 2001, the National Cancer Institute (NCI) highlighted research on tobacco and tobacco-related cancers in its annual budget document. The Department of Health and Human Services' (DHHS) *Healthy People 2010* continues to make smoking cessation and prevention a priority.

The Women, Tobacco, and Cancer Working Group was formed to respond to the priorities identified in these and other plans and reports. The group focused on identifying ways to stimulate scientific research and suggesting approaches to translate knowledge into interventions to prevent tobacco-related cancers in women in the United States and other countries. The Working Group, a public/private partnership led by NCI, met in Houston, Texas, in February 2003. This Report summarizes the recommendations of the breakout groups at the February 2003 Women, Tobacco, and Cancer Working Group meeting (see the *Summary of Recommendations*, pages 3-4).

Implementing the strategies described in the report will advance our progress toward the following goals:

## Discovery

**Increase our understanding of sex and gender differences\* across the broad range of research on women, tobacco, and cancer.**

A better understanding of the biological, psychological, and behavioral mechanisms and processes associated with women's and men's responses to nicotine exposure is critical to develop

better prevention and cessation interventions for addiction and to prevent and treat tobacco-related cancers. Research on genetic factors and hormonal variations throughout the life cycle should be emphasized in elucidating women's susceptibility to tobacco-related diseases and addiction, as well as responses to pharmaceutical and behavioral interventions. We need to understand how the interaction of gender, culture, race and ethnicity, and socioeconomic status affects women's and girls' use of tobacco products, perceptions of risk, and responses to relevant health messages. To conduct research that can be translated into effective applications, we must validate and standardize sex- and gender-appropriate definitions and measures of addiction, exposure, injury, and recovery.

## Development

**Develop new and more effective interventions to prevent and treat tobacco use and environmental tobacco smoke (ETS) exposure among women and girls, especially in populations at greatest risk.**

We must translate basic and applied research into effective, evidenced-based prevention and treatment programs by using knowledge from animal studies, pilot projects, and small-scale clinical and community-based trials. By using or modifying existing mechanisms, we can rapidly evaluate promising interventions, programs, and policies—such as the World Health Organization Framework Convention on Tobacco Control—on tobacco use by women and girls, both nationally and globally. We need to evaluate and monitor the impact of tobacco control policies on tobacco use by women and girls, both nationally and globally. State-of-the-art, audience-tailored communication strategies should be used to develop and disseminate evidence-based messages that target women and girls.

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\* "Sex and gender differences" are defined as follows in the 2001 Institute of Medicine (IOM) report *Exploring the Biological Contributions to Human Health—Does Sex Matter?:* "The committee defines sex as the classification of living things, generally as male or female according to their reproductive organs and functions assigned by the chromosomal complement, and gender as a person's self-representation as male or female, or how that person is responded to by social institutions on the basis of the individual's gender presentation. Gender is shaped by environment and experience." (16)

## Delivery

### **Ensure the widespread delivery of effective interventions to prevent and treat tobacco use and ETS exposure among women and girls.**

The reach and impact of evidence-based tobacco control programs, policies, and counter-advertising campaigns must be expanded by increasing the appeal, access, affordability, and use of effective interventions, particularly among women and girls in populations at greatest risk. We need to identify and use targeted strategies to involve individuals, communities, policy makers, and organizations, especially women's organizations and those that have not previously been involved in tobacco control.

## Partnerships

### **Harness and expand partnerships, networks, and innovative research platforms to design and launch broad-based strategies to eliminate the harms of tobacco use and ETS exposure.**

Successfully implementing the discovery, development, and delivery recommendations will require capitalizing on existing collaborations and developing new partnerships. To maximize the development and dissemination of effective interventions, partners must be involved from the beginning, and knowledge gained from practice should be used to inform future research. We need to encourage researchers to investigate common pathways of tobacco-related disease mechanisms by fostering networks of clinical and translational researchers. Community-based participatory research needs to be conducted through partnerships between research institutions and community-based organizations, especially those that serve populations at greatest risk. Because of the magnitude and persistence of the tobacco use problem in American Indian/Alaska Native populations, it is particularly important to develop partnerships between research institutions and tribal colleges, tribal health departments, and/or American Indian health care and community settings. Similarly,

partnerships with organizations that serve women with low levels of education and women of low socioeconomic status are also a key priority.

## Evaluation and Surveillance

### **Improve national and global evaluation and surveillance of the harms of tobacco use and ETS exposure and of women's and girls' knowledge, attitudes, and behaviors related to tobacco use and harms.**

It is essential to monitor and evaluate progress toward reducing tobacco use and the impact of tobacco-related cancers on women. This will require further development of standardized measures and surveillance systems to ensure that data are comparable within and across nations. Information obtained will help strategically target funding to ensure that gains are maintained while expanding support for tobacco control among the general public, including policy makers. Identification and dissemination of best practices will inform researchers and practitioners about which prevention and cessation interventions are the most effective and help determine how to tailor core interventions to specific populations.

The Working Group believes that reducing and ultimately eliminating the harmful effects of tobacco use on women requires integrating advances in our understanding of basic biologic, behavioral, and social factors to develop new prevention and treatment interventions and ensure the delivery of new evidence-based interventions to all women who need them. As interventions are delivered, their impact on individual and public health must be evaluated and monitored to inform future research and development. Successful implementation of all of the recommendations of the Women, Tobacco, and Cancer Working Group will require many collaborations and partnerships between Federal and non-Federal organizations. Such efforts have the potential to rapidly decrease tobacco use and ETS exposure and, ultimately, morbidity and mortality.



# Summary of Recommendations

DISCOVERY	DEVELOPMENT	DELIVERY
<p><b>OVERALL GOAL:</b> Increase our understanding of sex and gender differences* across the broad range of research on women, tobacco, and cancer.</p>	<p><b>OVERALL GOAL:</b> Develop new and more effective interventions to prevent and treat tobacco use and ETS exposure among women and girls, especially in populations at greatest risk.</p>	<p><b>OVERALL GOAL:</b> Ensure the widespread delivery of effective interventions to prevent and treat tobacco use and ETS exposure among women and girls.</p>
<p>A better understanding of sex and gender differences is critical to eliminating tobacco use and tobacco-related cancer morbidity and mortality in women and men.</p> <p>Multidisciplinary research is needed on:</p> <ul style="list-style-type: none"> <li>■ Sex differences in the mechanisms and processes associated with:                             <ul style="list-style-type: none"> <li>◆ All phases of tobacco addiction—from experimentation to regular use and addiction to cessation—including the natural history of the progression between phases and the effects of environmental tobacco smoke (ETS) exposure. This includes genetic, molecular, cellular, neurobiological, biobehavioral, and hormonal factors that play a critical role in tobacco addiction and in the etiology of cancers and other diseases caused by tobacco.</li> <li>◆ The etiology of cancers caused by tobacco, especially those related to gene-hormone-environment interactions involved in carcinogenic and other disease pathways.</li> <li>◆ Methods of prevention and treatment of tobacco addiction.</li> </ul> </li> <li>■ Gender-specific factors in tobacco use and the components of effective prevention and treatment interventions for women and girls, especially in populations at greatest risk, to:                             <ul style="list-style-type: none"> <li>◆ Identify behavioral, psychosocial, sociocultural, and environmental influences on tobacco use, exposure to ETS and disease risk, and prevention and treatment interventions.</li> <li>◆ Assess women’s and girls’ knowledge of the harms of tobacco use and ETS exposure and the benefits of quitting.</li> </ul> </li> </ul> <p>Multidisciplinary research is needed to:</p> <ul style="list-style-type: none"> <li>■ Validate and standardize sex- and gender-appropriate definitions and measures of addiction, ETS exposure, tissue injury, and recovery.</li> </ul>	<p>Translating basic and applied research into effective, evidence-based prevention and treatment programs and broad public health tobacco control policies will require:</p> <ul style="list-style-type: none"> <li>■ Using evidence from animal studies, pilot projects, and small-scale clinical and community-based studies to develop, refine, and evaluate promising sex- and gender-appropriate interventions for prevention, cessation, and treatment.</li> <li>■ Using or modifying existing infrastructures to rapidly evaluate the efficacy of promising treatments and the effectiveness and cost-effectiveness of proven small-scale interventions, programs, and policies.</li> <li>■ Developing and disseminating evidence-based cessation, prevention, and advocacy messages targeted to women using state-of-the-art, audience-tailored communication strategies.</li> <li>■ Conducting research to explore and strengthen the positive health impacts of public and private tobacco control policies on women and girls, especially in populations at greatest risk, and improving the adoption of evidence-based policies and strategies by policy and decision makers.</li> <li>■ Monitoring the harmful effects of tobacco marketing targeted to diverse populations of women and girls domestically and globally.</li> </ul>	<p>Expanding the reach and impact of evidence-based tobacco control programs and policies will require:</p> <ul style="list-style-type: none"> <li>■ Increasing the appeal, access, affordability, and use of effective interventions, particularly among women and girls in populations at greatest risk.</li> <li>■ Identifying and using targeted messages and strategies to involve and activate individuals and organizations in effective, sustained advocacy for evidence-based tobacco control programs and policies.</li> <li>■ Making data from surveillance and policy research, as well as social, economic, and cultural studies, available to the health care community, policy makers, and the general public in a timely and effective fashion.</li> <li>■ Supporting research and demonstration projects to better understand how to convert women’s broad-based support for tobacco control policies and programs into more active involvement in their communities.</li> </ul> <p style="text-align: right;">* See footnote on page 1.</p>

## Summary of Recommendations (continued)

PARTNERSHIPS	EVALUATION AND SURVEILLANCE
<p><b>OVERALL GOAL:</b> Harness and expand partnerships, networks, and innovative research platforms to design and launch broad-based strategies to eliminate the harms of tobacco use and ETS exposure among women and girls.</p>	<p><b>OVERALL GOAL:</b> Improve national and global evaluation and surveillance of the harms of tobacco use and ETS exposure, and of women’s and girls’ knowledge, attitudes, and behaviors related to tobacco use and harms.</p>
<p>Successfully implementing the discovery, development, and delivery recommendations will require capitalizing on existing collaborations and developing new partnerships. To maximize the development and dissemination of effective interventions, partners must be involved from the beginning, and knowledge gained from practice should be used to inform future research.</p> <p>Partnerships are especially needed between:</p> <ul style="list-style-type: none"> <li>■ Established networks of clinical and translational researchers that can provide the resources and infrastructure needed to foster cross-disciplinary interactions and rapidly evaluate treatments and interventions.</li> <li>■ Research institutions and community-based organizations that serve populations at greatest risk to conduct community-based participatory research. These partners must be committed to joint decision making in designing research, sharing ownership of the products of research, and disseminating and implementing research results.</li> <li>■ Research institutions and tribal colleges, tribal health departments, and/or American Indian health care and community settings to develop effective, culturally appropriate individual, family, and community-level tobacco prevention and cessation initiatives.</li> <li>■ Public and private funding agencies to fully and efficiently support the implementation of successful interventions.</li> </ul>	<p>It is essential to monitor and evaluate progress toward reducing tobacco use, ETS exposure, and the impact of tobacco-related cancers on women and to make midcourse adjustments as needed. This will require further development of standardized measures and surveillance systems to ensure that data are comparable within and across countries.</p> <p>Local, national, and global evaluation and surveillance will be critical for:</p> <ul style="list-style-type: none"> <li>■ Monitoring and measuring national and global trends and patterns in tobacco use and exposure to ETS using standardized measures.</li> <li>■ Ensuring that research and programmatic funding are strategically targeted and, where appropriate, tailored to specific populations.</li> <li>■ Assessing whether progress has been made and whether it is due to specific interventions and policies.</li> <li>■ Identifying effective interventions through success stories and rigorous case studies to inform researchers, encourage broader dissemination, and increase public support.</li> </ul>

# Introduction

For far too long, tobacco use has been viewed as a men's issue, but the use of tobacco among women around the world is now common. As a result, women have experienced a dramatic upsurge in cancers, cardiovascular and lung disease, and other life-threatening conditions caused by tobacco use. For example, between 1950 and 1997, lung cancer mortality for white women in the United States increased by over 600 percent (1). Women who smoke also experience higher rates of cancers of the mouth, pharynx, esophagus, larynx, bladder, pancreas, kidney, and cervix—and possibly other sites. In addition, these women have an increased risk of developing and dying from cardiovascular disease and chronic obstructive pulmonary diseases, including chronic bronchitis and emphysema with airflow obstruction. Currently, it is estimated that 1 in 5 U.S. women smoke and 170,000 U.S. women die each year from smoking (1).

Smoking prevalence decreased among U.S. women from 34 percent in 1965 to 20 percent in 2002, but most of this decline happened between 1974 and 1990; prevalence declined more slowly in the 1990s (1, 2). Smoking rates remain alarmingly high among certain U.S. populations. In 2002, approximately 22 percent of white women in the United States were current smokers, but the rate among American Indian/Alaska Native women was 41 percent (2). Moreover, smoking prevalence is almost three times higher among women who did not finish high school than among those with a college degree (3). Smoking rates are significantly lower among women in economically developing countries (about 9 percent) than in economically developed countries, where the average rate is 22 percent (4).

As might be expected in economically developing countries where smoking rates among women are relatively low, lung cancer death rates are also low (1). With increased female autonomy, increased marketing of tobacco products to women, and changes in women's roles, smoking uptake and ensuing disease are expected to increase in economically developing countries (5). In addition, women's use of traditional forms of tobacco is already widespread in many economically developing countries (6). Reflecting this, a recent article notes that "curtailing the increase in tobacco use among women in developing countries represents one of the greatest opportunities for disease prevention in the world today" (7).

## Impetus for This Report

The 2001 report of the Surgeon General, *Women and Smoking*, identifies five strategies to reduce smoking among women:

- Increase awareness of the impact of smoking on women's health and counter the tobacco industry's targeting of women.
- Support women's antitobacco advocacy efforts and publicize that most women are nonsmokers.
- Continue to build the science base on gender-specific outcomes and on how to reduce disparities among women.
- Act now: we know more than enough.
- Stop the epidemic of smoking and smoking-related diseases among women globally.

In addition, in 2001, NCI began to highlight research on tobacco and tobacco-related cancers as an Extraordinary Opportunity for Research in its annual budget document, *Plans and Priorities for Cancer Research*. The Department of Health and Human Services' *Healthy People 2010* continues to make smoking cessation and prevention a priority. Relevant goals include reducing smoking prevalence and decreasing death rates from both lung cancer and cancer overall.

## Working Group on Women, Tobacco, and Cancer

The Women, Tobacco, and Cancer Working Group was formed to respond to the priorities identified in these and other plans and reports. In particular, the group focused on identifying ways to stimulate scientific research and suggesting approaches to translate knowledge into action to prevent tobacco-related cancers in women in the United States and abroad. The Working Group, a public/private partnership led by NCI, is a multidisciplinary group of experts from Federal and non-Federal research and advocacy organizations.

The Working Group meeting held in Houston, Texas, in February 2003 and this Report are the culmination of the dedicated efforts of the Breakout Group Co-Chairs and the Working Group's Steering Committee. A more detailed description of the Working Group process, a meeting agenda, and the Steering Committee and Working Group rosters can be found in the appendices following the Report.

## Organization of This Report

This Report summarizes the recommendations of the breakout groups at the February 2003 Women, Tobacco, and Cancer Working Group meeting. These summary recommendations are organized under five cross-cutting goals in the following areas:

- Discovery
- Development
- Delivery
- Partnerships
- Evaluation and Surveillance

These goals reflect the themes of the breakout group discussions, as well as the framework adopted by NCI in 2001 to meet its Challenge Goal of eliminating the suffering and death due to cancer by 2015.

The recommendations discussed in this Report are drawn from the deliberations of the seven breakout groups at the Working Group meeting:

- Biology and Cancer
- Addiction

- Epidemiology and National Surveillance
- Interventions for Prevention and Treatment
- Awareness, Risk Perception, and Communications
- Community and Policy Interventions
- Global Issues

Complete breakout group summaries are included in the appendices at the end of the Report.

We believe that to reduce and ultimately eliminate the harmful effects of tobacco on women, we must integrate advances in our understanding of basic biologic, behavioral, policy, and social factors. This will lead to the development of new prevention and treatment interventions and help ensure that the interventions delivered to women are evidence based. As interventions are delivered, their impact on individual and public health must be monitored and evaluated to inform future research and development. Strong Federal, state, local, and private partnerships will also be needed to implement the recommendations.

# Recommendations

## Discovery

**Overall Goal: Increase our understanding of sex and gender differences across the broad range of research on women, tobacco, and cancer.**

**A better understanding of sex and gender differences\* is critical to eliminating tobacco use and tobacco-caused cancer morbidity and mortality in women and men.**

Research suggests that women differ from men in their biological responses to nicotine, progression to nicotine dependence, and patterns of intake and that women have higher rates of relapse and greater risk of health problems caused by smoking (8-15). However, the effects of oral contraceptives, menopause, hormone replacement therapy,

**Discovery** refers to the process that generates new knowledge about fundamental disease processes at the genetic, molecular, cellular, organ, individual, and population levels.

and other sex-related factors on smoking rates, craving, and relapse are not well understood. The menstrual cycle, puberty, pregnancy, and menopause

should be primary foci of research on nicotine dependence and tobacco use to determine, for example, whether nicotine has a disruptive effect on hormone levels and whether sex hormones can affect craving and rates of relapse. Ovarian hormones may modulate response to medications, which may account for women's lower success rates in quitting in response to certain pharmacotherapies.

Some case-control studies suggest that women are more susceptible to tobacco-induced carcinogenesis than men, after taking into account baseline exposure, body weight, body height, and body mass index (17). However, cohort studies have not supported this observation (18). Estrogen or menopausal status has an impact on lung cancer risk in women, and some evidence indicates a positive interaction between menopausal estrogen therapy, smoking, and the development of adenocarcinoma of the lung (19). A better

understanding of the role of estrogens in premalignant and malignant disease progression may lead to the development of antiestrogen therapies for lung cancer prevention and treatment.

Depression, which is more common in women than in men, is associated with higher dependency on smoking (20). Women are more likely than men to smoke in response to stress and negative affect (1, 21, 22). However, the underlying mechanisms of the relationships among tobacco use, negative affect, and stress are not fully understood. Research aimed at testing interventions to help women with depression quit smoking must take into account the multiple demands and unique stressors in the daily lives of women.

Differences in smoking prevalence and patterns of use among women belonging to different subgroups (as defined by socioeconomic status, race, culture, and ethnicity) may affect initiation and cessation. It is important that cultural and, potentially, biological differences inform prevention and cessation programs targeting particular groups (23). Concurrently, understanding what cultural and social factors protect women from tobacco is also valuable, particularly in cultural groups where traditional roles for women are changing in ways that may facilitate tobacco use.

## Discovery Recommendations

**1.a Multidisciplinary research is needed on sex differences in the mechanisms and processes associated with all phases of tobacco addiction—from experimentation to regular use and addiction to cessation—including the natural history of the progression between phases and the effects of environmental tobacco smoke (ETS) exposure. This includes genetic, molecular, cellular, neurobiological, biobehavioral, and hormonal factors that play a critical role in tobacco addiction and in the etiology of cancers and other diseases caused by tobacco.**

**Multidisciplinary research** integrates technologies and knowledge from a variety of interrelated fields.

\* See footnote on page 1.



Research is needed to address:

- *Environmental, behavioral, genetic, molecular, cellular, neurobiological, and hormonal sources of variation in nicotine use and addiction.* Sex differences must also be studied at different stages of life, taking into consideration biological, behavioral, and environmental factors.
- *The interactions of the different sources of variation in animals and humans during all phases of nicotine addiction, including initiation, maintenance, withdrawal, and relapse.* In particular, the genetic influences on different stages of tobacco use require further investigation because these influences may vary. In addition, a better understanding of how genes and the environment interact to increase susceptibility to tobacco use is needed.
- *The natural history of tobacco use, including initiation, maintenance, cessation, and relapse (24).* Some recent data indicate that the patterns of initiation and maintenance may be changing (25), and these apparent changes may affect tobacco use prevalence and the incidence and prevalence of tobacco-related morbidity and mortality in the future. It is not known whether the observed patterns are similar or different for different subpopulations. Variation in the natural history of tobacco use across populations within a nation and across nations should be more fully explored.

#### **1.b Multidisciplinary research is needed on sex differences in the mechanisms and processes associated with the etiology of cancers caused by tobacco, especially those related to gene-hormone-environment interactions involved in carcinogenic and other disease pathways.**

Research is needed to address:

- *Cross-disciplinary research on mechanisms of tobacco-related disease.* Estrogen status, for example, is recognized as a factor that affects lung cancer risk in women. Estrogen or one of its metabolites may be a weak carcinogen, but studies have not addressed this in depth, particularly in relationship to tobacco use. An understanding of the role of estrogens in the pathogenesis of lung cancer should facilitate the selection and evaluation of antiestrogen therapies for the treatment of this disease. Further insight into sex-specific pathways for lung carcinogenesis may be gained through the use of proteomic and genomic

approaches in the analysis of early lesions and established tumors obtained from both women and men.

- *Common pathways between inflammation and tobacco-caused disease.* To date, relatively little research has focused on the interplay between inflammation and the development of lung cancer. Further understanding is needed of the effects of oxidative stress on lung biology and the mechanisms controlling the expression and release of pro-inflammatory mediators in the lung.

In **transdisciplinary research**, teams from a variety of relevant fields collaborate to address a common problem using shared concepts and approaches.

Transdisciplinary investigations are also needed to understand common pathways of cancer, heart disease, and lung disease caused by tobacco.

- *The variety of cellular processes regulated by nicotine and other tobacco smoke constituents to identify new therapeutic targets for intervention in tobacco-related diseases.* Further understanding of the mechanisms by which nicotine alters cell growth is also important to further guide pharmacologic therapy.

#### **1.c Multidisciplinary research is needed on sex differences in the mechanisms and processes associated with methods of prevention and treatment of tobacco addiction.**

Research is needed to address:

- *Whether sex and gender differences exist in prevention and treatment efficacy.* Studies have produced conflicting results as to whether women have the same, less, or more difficulty quitting smoking than men (26-32). Methodological limitations may account for the uncertainty.
- *Whether physiological, psychological, and/or behavioral factors mediate or moderate differences between men and women in responses to treatment and tobacco use cessation.* These differences may be due to a number of factors, including depression, nicotine dependence, withdrawal, demographics, social support, coping styles, expectancies, and weight concerns. To date, research has not adequately addressed these issues.
- *The influence of factors unique to women—such as the menstrual cycle, pregnancy, and menopause—on tobacco use*

*behavior and treatment efficacy.* While some factors, such as pregnancy, have been associated with increased quit rates, others have not been well explored. Targeting these events will make it possible to capitalize on potential windows of opportunity.

- *Effective strategies for tailoring interventions to women.* Identifying whether sex and gender differences exist and the factors through which they affect tobacco use will lead to the targeting and tailoring of prevention and intervention efforts.

## 2.a Multidisciplinary research is needed on gender-specific factors in tobacco use and the components of effective prevention and treatment interventions for women and girls, especially in populations at greatest risk, to identify behavioral, psychosocial, sociocultural, and environmental influences on tobacco use, exposure to ETS and disease risk, and prevention and treatment interventions.

**Populations at greatest risk for tobacco use and tobacco-related disease** include women with low income and/or low levels of education, members of certain racial and ethnic groups, pregnant women, and women with mental health or other substance abuse disorders.

Research is needed to address:

- *Tobacco use among different populations.* Tobacco use varies among population subgroups, and increasingly, the devastating health effects of tobacco are concentrated in certain populations. Race, ethnicity, socioeconomic status, age, sexual orientation, disability, and culture may all play a role in initiation, maintenance, and cessation of tobacco use. Yet, adequate data on tobacco use are lacking for many population subgroups. To more precisely identify disparities, it is necessary to assess the interrelationships of specific population characteristics as they influence tobacco use, exposure to ETS, and disease risk. Understanding how these differences affect tobacco use behaviors will allow us to identify social and contextual factors that could aid in prevention and treatment for all women and help reduce health disparities.

- *The role of gender issues and the interaction of gender, culture, and ethnicity in the continuum from experimentation to addiction.* Experimentation with and initial exposure to tobacco occur early, and the time from experimentation to addiction is very brief (33, 34). Factors that contribute to experimentation and regular tobacco use are not well understood.
- *Social contextual factors, such as partner and household tobacco use, social networks, social ties, and discrimination.* Interest in cessation and vulnerability to relapse may be influenced by these factors. Family, social, and cultural factors may be especially important for minority and underserved women who have limited access to care and may depend on existing social networks for support.

## 2.b Multidisciplinary research is needed on gender-specific factors in tobacco use and the components of effective prevention and treatment interventions, especially in populations at greatest risk, to assess women's and girls' knowledge of the harms of tobacco use and ETS exposure and the benefits of quitting.

Research is needed to address:

- *Women's current levels of knowledge of the risks of tobacco use and their assessment of their personal risk.* More research is needed to determine accuracies and inaccuracies in women's knowledge about tobacco use, prevention, and cessation and the interplay of affective, experiential, and cognitive approaches to assessing risk and deciding what course of action to take. This research should identify mechanisms to which women will respond and focus on different ethnic, socioeconomic, and health status groups across the lifespan.
- *Women's perceptions of the addictiveness of tobacco and their understanding of the process by which people become addicted.* Further research is needed to explore how beliefs about the addictiveness of tobacco are formed and how prevention messages can counteract inaccurate impressions of individual control.
- *Culturally relevant messages and entry points that respond to women's perceived needs.* It is important to understand the meaning of tobacco use to women in its historic social context, especially in economically developing countries, where tobacco use is frequently linked to emancipation and "Western" culture. Investigation of the knowledge, attitudes, and practices of women who use smokeless

and traditional forms of tobacco is also important, particularly in some economically developing countries where these products are commonly used by women. The role of men as positive or negative influences on women's health also needs further investigation.

**3. Multidisciplinary research is needed to validate and standardize sex- and gender-appropriate definitions and measures of addiction, ETS exposure, tissue injury, and recovery.**

Research is needed to further develop:

- *The definition of nicotine addiction/dependence.* Reasons for tobacco use vary among individuals and, probably, across population subgroups, time, and situations. A more precise definition of nicotine addiction will make it possible to better define sex-relevant experimental parameters.
- *Appropriate instruments for assessing nicotine dependence.* Addiction/dependence appears to be multidimensional and may include physical, behavioral, and physiological components (35-38). To date, none of the instruments

commonly used to measure nicotine dependence assesses all aspects, and the intercorrelation of these instruments is surprisingly low (38). Therefore, better measures need to be developed to identify differences in nicotine dependence between men and women and between adults and adolescents.

- *Validated, biologically relevant measures of tobacco smoke exposure, injury, and recovery.* Validating these measures includes linking measures of exposure to those of injury in biological models, linking measures of injury to outcomes, examining modifying factors of injury from exposure, and investigating new tobacco products. Intermediate markers between injury and disease must be identified. Although several good models are available, identifying the effects of tobacco exposure in these models is time consuming, pointing to the need for accelerated models as well as for mixture and single-agent models (39). The biomarkers identified can be used to provide a more specific and efficient tool for assessing biological exposure and effect and, thus, identifying persons at risk.



## Development

**Overall Goal: Develop new and more effective interventions to prevent and treat tobacco use and ETS exposure among women and girls, especially in populations at greatest risk.**

**To eliminate the harms caused by tobacco use and ETS exposure among women and girls, especially those in populations at greatest risk, basic and applied research must be translated into effective, evidence-based prevention and treatment programs and broad public health tobacco control policies.**

Knowledge gained from research is critical to developing effective interventions for both smoking and disease prevention for women and girls, as well as for cessation and disease treatment. This is especially important because evidence indicates that women respond differently to treatments than men. For example, research has found that

**Development** refers to the process of creating and evaluating tools and interventions using knowledge gained through research, to reduce the cancer burden through the prevention, early detection, diagnosis, and treatment of cancer and its consequences.

women are more responsive than men to telephone quit-line use and support (40). Research has also shown that women are more concerned about their weight than men. Unfortunately, smoking cessation often leads to weight

gain, and some evidence suggests that women are less likely than men to seek treatment or attempt to quit smoking on their own because of this issue (41, 42). Other factors that are unique to women and girls that may influence smoking behaviors and treatment efficacy include phase of menstrual cycle, pregnancy, menopausal status, and use of hormone therapies. Knowledge of sex and gender differences and the sequelae of these unique factors will provide a better understanding of how treatments should be designed for women and girls.

Research findings must be shared between the basic and applied research communities and integrated into the

development and refinement of interventions. Understanding the effects of such variables as sex and gender, culture, ethnicity, educational level, and socioeconomic status is critical in designing effective interventions. Community intervention research and community-based research have provided valuable insights for the design of state- and community-level interventions that have helped reduce tobacco use (43-45). Examples include the NCI Community Intervention Trial for Smoking Cessation (COMMIT) and the American Stop Smoking Intervention Study (ASSIST) (46).

Increasing communication between researchers and practitioners will help ensure that research designs are informed by practitioners' constraints and that researchers are investigating issues that reflect population needs. Increased multidisciplinary collaboration will also aid in the development of the most cost-effective and efficient practices possible. Best practices in the United States should be shared with other countries, but they must be adapted to the cultural, social, and economic needs of local communities. For example, mass media campaigns should be modified in communities and countries where community leaders have more influence than print media among illiterate women. Given the need to strengthen leadership in economically developing countries, greater effort must also be made to exchange knowledge and success stories between the economically developed and developing worlds. We have much to learn from each other.

### Development Recommendations

- 1. Translating basic and applied research into effective, evidence-based prevention and treatment programs and broad public health tobacco control policies will require using evidence from animal studies, pilot projects, and small-scale clinical and community-based studies to develop, refine, and evaluate promising sex- and gender-appropriate interventions for prevention, cessation, and treatment.**

Evidence from the following should be used:

- *Animal studies, pilot projects, and small-scale clinical and community-based studies.* Animal studies may be useful in understanding the role of behavioral, hormonal, genetic, neurobiological, and environmental factors in nicotine addiction. These models will help in the development of potential behavioral and pharmacologic interventions

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