Recent Advances
In Tobacco Science

Volume 43

Engagement Across Disciplines:
Tobacco Science in the 21st Century

Symposium Proceedings
71st Meeting
TOBACCO SCIENCE RESEARCH CONFERENCE

November 28 - December 1, 2017
Bonita Springs, Florida USA
Symposium of the 71st Tobacco Science Research Conference

Engagement Across Disciplines:
Tobacco Science in the 21st Century

– Symposium Chair –
Ian M. Fearon

– Editors –
Ian M. Fearon
Summer N. Hanna
Kathy E. Humphries
CONTENTS

Contributors .................................................................................................................. IV

Preface ......................................................................................................................... V

Introduction to Symposium ......................................................................................... 1
Ian M. Fearon

INDUSTRY ENGAGEMENT WITH THE SCIENTIFIC COMMUNITY ................................................................. 3
Willie J. McKinney

THE ROLE OF INDUSTRY IN ENGAGING WITH INDUSTRY TO DEVELOP REGULATORY-APPROVED METHODS FOR TOBACCO AND NICOTINE PRODUCT ASSESSMENT ........................................... 9
Christopher J. Proctor

FACTORS AFFECTING MEDIA COVERAGE OF TOBACCO RESEARCH NEWS .................................................. 21
Cheryl K. Olson

VAPERS AND THE VAPING INDUSTRY ARE THE PRIMARY AGENTS OF TOBACCO HARM REDUCTION IN THE UNITED STATES .................................................................................................................. 47
Christopher Russell
Symposium of the
71st Tobacco Science Research Conference

Engagement Across Disciplines:
Tobacco Science in the 21st Century

– CONTRIBUTORS –
Amy E. Brannan
Ian M. Fearon
Derek Mariner
Willie J. McKinney
James Murphy
Cheryl K. Olson
Christopher J. Proctor
Christopher Russell
Donna C. Smith
Christopher Wright
The Program Editorial Committee of the 71st Tobacco Science Research Conference is pleased to present the 43rd volume of the Recent Advances in Tobacco Science publication. Each year the Program Editorial Committee of the Conference selects a theme that highlights a scientific or regulatory issue that is relevant, engaging and thought-provoking for all of the tobacco science community. This year, the committee has chosen “Engagement Across Disciplines: Tobacco Science in the 21st Century” for this year’s symposium theme. The symposium discusses the topic of scientific engagement both within and outside of the tobacco industry and looks towards how tobacco industry engagement might take shape in the future. Four distinguished speakers were invited to provide their unique insights into different aspects of tobacco science engagement; within the industry, with the broader scientific community, through the media and with consumers. This publication contains the synopses of the symposium presentations and introductory remarks that include a brief biographical sketch of the symposium speakers. Members of the Program Editorial Committee, Summer Hanna, Kathy Humphries and I, wish to express our sincere appreciation to the speakers, Drs. Chris Proctor, Cheryl Olson, Willie McKinney, and Chris Russell and their colleagues for the significant time and effort spent preparing the publications and presentations.

Ian M. Fearon
Chair, Program Editorial Committee
71st Tobacco Science Research Conference
INTRODUCTION TO THE SYMPOSIUM

Ian M. Fearon

British American Tobacco
Southampton, United Kingdom

Scientific engagement is a key part of all of our working lives as tobacco science researchers. Traditionally, the main route of our engagement and scientific communication has been through peer-reviewed publications and both oral and poster presentations at scientific conferences such as TSRC. Recent years however have seen a shift in this pattern, and our science is being more broadly communicated and through new channels such as the media and through direct communications with the consumers of the products we develop and make. Increasingly also, we are required to engage and communicate with regulatory authorities who oversee the development, production and marketing of nicotine and tobacco products.

The choice of symposium topic, ‘Engagement Across Disciplines: Tobacco Science in the 21st Century’, was chosen by the Program Editorial Committee to highlight the traditional and new routes of engagement and scientific communication. We hope that this will be of interest to all attendees at the TSRC conference across the range of scientific interests of attendees, from plant biology, through product development innovation, and on to consumer engagement and post-market research. Of importance, the Symposium will also pay attention to industry collaboration, which many see as a critical element as the industry may be better placed if it acts in concert in many disciplines of scientific research and communication.

Dr. Willie McKinney, Vice President of Regulatory Sciences at Altria Client Services, will open the Symposium with a talk entitled ‘Industry Engagement with the Scientific Community’. Dr McKinney has had a distinguished career as both an academic and an industry scientist, and is currently serving on FDA’s Tobacco Product Scientific Advisory Committee (TPSAC) as the non-voting representative of the tobacco manufacturing industry. His experience will enable him to authoritatively discuss how the industry can benefit from its interactions with stakeholders in the broader scientific community, and his presentation will provide a unique insight into the drivers of academic science and university scientists and discuss how a better relationship can help us work towards a common goal of tobacco harm reduction.

Dr. Chris Proctor, Chief Scientific Officer at British American Tobacco, will follow with a paper entitled ‘The role of industry consortia to develop regulatory-approved methods for tobacco and nicotine product assessment’. Dr. Proctor was more than 25 years of experience of the tobacco industry and regulatory engagement, and in recent years has been a key driver in cross-industry collaboration in areas such as in vitro models of toxicology
and population modelling. His presentation will discuss why such collaborative efforts are important in a modern tobacco and nicotine industry and uses case studies from other industries to highlight the benefits that the regulated industry can gain from working together on non-competitive areas of scientific research.

Following on from this, Dr. Cheryl Olson will talk about ‘Factors affecting media coverage of tobacco research news’. Dr. Olson is an independent consultant and an internationally-renowned expert on using media to change behavior, particularly in the area of promoting mental and physical health. Drawing on her experience of working across a range of different areas and with diverse companies such as VTech, Philip Morris USA and Activision, she will provide a unique insight into the quality, nature and motivations of press coverage of scientific findings, using recent examples of the reporting of studies on the health effects of tobacco, nicotine or e-cigarettes to reveal emerging patterns and trends. Her presentation will conclude by touching on how researchers can act to improve the likelihood and quality of media coverage of research findings.

The final presentation of the Symposium will be made by Dr. Christopher Russell, an independent behavioural psychology Senior Research Fellow at the Centre for Substance Use Research in Glasgow, Scotland. Dr Russell leads the Centre’s tobacco harm reduction research studies, with a particular focus on how vapers and e-cigarettes are helping smokers to quit smoking. In recent years, Dr. Russell has been a key figure in understanding the harm reduction potential and risks/benefits of e-cigarette use and in particular he has used several multi-national surveys to understand the drivers, motivations and barriers to smokers’ using electronic cigarettes. With this experience his talk entitled ‘Vapers and the vaping industry are the primary agents of tobacco harm reduction in the United States’ will give his insight into how the manufacturers and consumers of e-cigarettes are driving tobacco harm reduction efforts and how current smokers, who are potential consumers of harm reduction products, can be assisted in quitting smoking using online electronic resources and peer-to-peer support.

Following the presentations, the symposium will conclude with an open panel discussion. All of the speakers will be invited back to the stage where they will field questions pertaining to scientific engagement and communication. We encourage attendees to make the best use of the speakers’ collective wealth of expertise and knowledge in this area and to actively participate in this question and answer session.

The Editorial Committee would like to recognize the speakers and organisations for their contributions to the symposium and extend our gratitude for their participation. We hope that the symposium is found to be informative, insightful and inspiring to conference participants and that the topics presented in the symposium will promote dialogue and collaboration towards our common interest of communicating and engaging with different stakeholders on our scientific research.

Ian M. Fearon
71st TSRC Symposium Chair
INDUSTRY ENGAGEMENT WITH THE SCIENTIFIC COMMUNITY

Willie J. McKinney, Amy E. Brannan and Donna C. Smith
Altria Client Services LLC
Richmond, Virginia USA

Abstract
Collaborations between industry scientists and the broader scientific community are common. Tobacco industry collaboration with public health scientists presents unique opportunities and challenges. The convergence of i) an FDA regulatory environment where FDA can make science and evidence based decisions about tobacco products and communications; ii) innovations by tobacco companies and concurrent evolving adult tobacco consumer expectations; and iii) divergent perspectives in the public health community relative to tobacco harm reduction all serve to create a nexus for tobacco industry, FDA and academic scientists to effectively collaborate. We all have a role advancing harm reduction. For example, industry and academic scientists may gather the scientific evidence to demonstrate the risk reduction potential of new innovative tobacco products. Their knowledge of cigarette smoke attributable-risk and adult tobacco consumer preferences is important for this analysis. Public health, including FDA, play a pivotal role in advancing harm reduction by educating adult smokers about the identified risk differential between tobacco products so that adult tobacco consumers can make informed decisions. Although productive, these collaborations face several challenges. Most notably, the history of the tobacco industry may sometimes negatively impact effective scientific engagement efforts. However, regardless of potential barriers, several new forums are facilitating productive communications between academic harm reduction enthusiasts, pessimists, public health and the tobacco industry. These forums serve to diminish barriers such as a lack of trust. This paper will present some of the conditions necessary for successful and productive tobacco industry engagement with the scientific community.

Introduction
A renewed focus on reducing the harm caused by cigarettes is providing a unique platform for new collaboration between a tobacco product manufacturer and the scientific community (academic bench and public health scientists). These collaborations have the potential to positively impact public health. With the ever-increasing importance of innovation as an instrument of cigarette harm reduction, it is imperative that a tobacco industry member and the scientific community find common ground. The convergence of i) an FDA regulatory environment where FDA can make science and evidence based decisions about tobacco products and communications; ii) innovations by tobacco companies and concurrent evolving adult tobacco consumer interest and expectations; and iii) divergent perspectives
in the public health community relative to tobacco harm reduction all serve to create a nexus for scientists in the tobacco industry to collaborate with the scientific community.

**Background**

While significant value may be gained from such collaborations, there are significant barriers to most industry/academic collaboration. The organizational drivers of success that exist in industry differ from academia. In addition, there are clearly different institutional norms governing public and private knowledge management.

For example, unlike industry, the process of creating public knowledge has been central to the growth of universities. In 1973, Merton established four sets of institutional imperatives that comprise the ethos of modern science. These imperatives are now known as Mertonian norms and researchers at academic institutions have been firmly rooted in these norms for centuries. These norms are the framework by which academics perceive the work that they do. These norms can be summarized as:

1. **Universalism** – scientific validity is independent of from where the science comes
2. **Communalism** – science should be open and free to promote collaboration
3. **Disinterestedness** – institutions of science do work for the advancement of science, not the advancement of individuals
4. **Organized skepticism** – scientific claims should be scrutinized both in the methods used and by the institutional codes of conduct of the institution that made the scientific claim

These norms are organizational in nature and describe attitudes and behavior of academia.

Although Mertonian norms are foundational for academic institutions, economic and social forces outside the science system itself may play a powerful role in shaping scientists and science (Freeman, 1999). For example, government funded research is applied, practically oriented, and focused on solving general social, technical or economic problems (Pavitt, 2001).

In contrast to the open nature of the academic science system described above, the primary motivation of industry knowledge creation activities is to develop products and intellectual property to gain advantage over competitors (Chesbrough, 2006).

The differences in organizational drivers, however, do not mean that there is not common ground between the two institutions. Table 1 on the next page
(reproduced from Ivascu et al. 2016) shows that in successful collaborations between industry and academia, a real potential exists to meet the organizational needs of both partners while producing significant value for society.

Table 1. Comparing organization drivers between academia and industry

<table>
<thead>
<tr>
<th>Academic Goals</th>
<th>Shared Goals</th>
<th>Industry Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public mission</td>
<td>Creating value for society</td>
<td>Shareholder value</td>
</tr>
<tr>
<td>Publications</td>
<td>Reputation</td>
<td>Revenue</td>
</tr>
<tr>
<td>Project research</td>
<td>Research</td>
<td>Practical research</td>
</tr>
<tr>
<td>Theoretical drivers</td>
<td>Science driven</td>
<td>Results driven</td>
</tr>
<tr>
<td>Shared resources</td>
<td>Competitiveness</td>
<td>Private resources</td>
</tr>
<tr>
<td>Sharing results</td>
<td>Value</td>
<td>Retain results</td>
</tr>
<tr>
<td>Creating knowledge</td>
<td>Sharing knowledge</td>
<td>Capturing knowledge</td>
</tr>
<tr>
<td>Open source</td>
<td>Collaborative innovation</td>
<td>Private source</td>
</tr>
<tr>
<td>Investigator needs</td>
<td>Consumer needs</td>
<td>Market needs</td>
</tr>
<tr>
<td>Education</td>
<td>Exchange know-how</td>
<td>Retain know-how</td>
</tr>
</tbody>
</table>

If collaborations between academia and industry in general are challenging, collaborations between academia and a tobacco industry member are especially tenuous due to the history of conflict and mistrust. For example, in an article from Public Health Reports in 2005, Lisa Bero outlines six strategies that are what she refers to as the manipulation of research by the tobacco industry:

1. Fund research that supports the interest group position.
2. Publish research that supports the interest group position.
3. Suppress research that does not support the interest group position.
4. Criticize research that does not support the interest group position.
5. Disseminate interest group data or interpretation of risk in the lay press.
6. Disseminate interest group data or interpretation of risk directly to policy makers.

Some members of the scientific community—including academic bench and public health scientists—still do not trust the integrity of scientific data generated by members of the tobacco industry. Lack of trust and other barriers such as organizational policies that require institutions to have bans on receiving money from tobacco companies in order to receive their funding and refusal of certain journals to publish science generated or funded by tobacco industry members have made collaborations more difficult, if not impossible.
Considerations
In order to achieve the common goal of tobacco harm reduction, we must acknowledge that the scientific questions and challenges associated with tobacco harm reduction (e.g., continuum of risk) are extremely diverse, complex and require the collective knowledge of the tobacco industry and scientific community.

In addition, it appears that trust may very well be the most important factor and the biggest barrier to fruitful collaborations between industry and academia. These collaborations can be well formed by professional and personal relationships (Bruneel et al., 2010). This suggests that a tobacco product manufacturer and the scientific community should begin the journey of building trust by understanding the different goals and incentives of one another and focus on face-to-face interactions. Specifically, scientists in the tobacco industry and academia must leverage opportunities to engage by attending conferences, presenting science and inviting questions and critique. Through these exchanges we begin to develop professional relationships, respect, healthy skepticism and, hopefully, eventually trust.

Each organization can build trust by making long-term investments in collaborations that are forged one small project at a time focused on common goals such as “creating value for society.” Scientists in the tobacco industry and academia may generate scientific evidence to demonstrate the risk reduction potential of new innovative tobacco products. Their shared knowledge of cigarette smoke attributable-risk and adult tobacco consumer preferences is important for this analysis. Subsequently, government institutions like FDA may utilize peer-reviewed science and evidence to make decisions about tobacco product risk and advance harm reduction by educating adult smokers about the identified risk differential between tobacco products so that adult tobacco consumers can make informed decisions.

We must address the barriers that impede the common goal of sharing scientific information via publications. Policies that impede the ability of either organization to publish do not benefit public health—in fact, these exclusionary policies may well serve to delay significant advances in harm reduction. Through publication, the tobacco industry and scientific community demonstrate their scientific capabilities as well as their dedication to openness and transparency.

Conclusion
Is the common goal of tobacco harm reduction sufficient to overcome a history of mistrust of research funded or conducted by tobacco product manufacturers? In our view, collaboration between a member of the tobacco industry and the scientific community seems possible; especially given the current regulatory
environment, adult tobacco consumer acceptance of innovative tobacco products and a common goal of tobacco harm reduction.

References

THE ROLE OF INDUSTRY CONSORTIA TO DEVELOP REGULATORY-APPROVED METHODS FOR TOBACCO AND NICOTINE PRODUCT ASSESSMENT

Christopher J. Proctor, Ian M. Fearon, Derek Mariner, Christopher Wright and James Murphy
British American Tobacco
Southampton UK

Abstract
Consensus methods for product assessment are commonplace across many industry sectors and often form the basis of regulatory approaches. In the pharmaceutical industry for example, the foundations for the assessment of the safety, quality and efficacy of new medicines were laid almost 30 years ago in cross-industry collaboration with regulators, leading to the inception of the ICH guidelines which are now applied globally.

Recently, in the tobacco industry, when an EU expert scientific panel advised that more scientific data was needed on specific additives used in cigarettes, it suggested that tobacco manufacturers could carry out joint studies to collect the required data. This is a similar approach to that taken with chemical manufacturers to achieve compliance with European chemical regulations.

There are some long-standing cross-industry fora that work on consensus methods, such as the Cooperation Centre for Scientific Research Relative to Tobacco (CORESTA). More recently the Institute for In Vitro Sciences (IIVS) hosted a workshop attended by industry scientists and FDA to establish principles for conducting in vitro pre-clinical assessment techniques. In Europe a broad stakeholder group comprising manufacturers, regulators and consumer groups was involved in developing the British Standards Institute (BSI) Publicly Available Specification for e-cigarettes and the Association Française de Normalisation (AFNOR) standards. Yet in other areas, such as the development of dynamic population models, individual companies have developed their own models independently of one another.

This paper looks at the importance of cross-industry collaboration in non-competitive contexts, the value of consensus standards for both industry and regulators, and some of the conditions necessary to develop standards trusted by all interested parties.
Introduction
Those outside the tobacco and nicotine industry may find it somewhat surprising that relatively little pre-market collaboration takes place, particularly in the field of developing product assessment tests for regulatory purposes. From the dual perspectives of regulators finding it easier to interpret data when that data is produced through standardised methodologies to the cost-effectiveness for industry of combining resources in developing and validating methodologies, and thus improving the likelihood of gaining regulatory acceptance, it would seem sensible that industries should collaborate in the pre-competitive space.

One of the key underlying reasons for this may be the historic lack of trust in the science undertaken by the tobacco industry. Internationally, when the World Health Organization (WHO) was considering as part of the Framework Convention on Tobacco Control (FCTC) which constituents in cigarette smoke might be included for testing and how such testing should be performed, it took the view that methods previously developed by the industry through CORESTA and the International Organization for Standardization (ISO) Technical Committee 126 were not to be trusted. Consequently, the FCTC Conference of the Parties requested the WHO Tobacco Free Initiative to set up and fund an international consortium of laboratories (Tobacco Laboratory Network, TLN) to develop WHO-approved methods for a limited set of constituents (1). This effort took several years and the methods recommended by WHO are, in most cases, similar to those previously recommended by CORESTA and which have formed the basis for ISO standards.

There are parallels with car emissions testing, in which methods developed in the 1960s and 1970s with the involvement of environmental agencies and car manufacturers are considered today as not being fit-for-purpose or open to misuse (2). Despite early involvement of regulators with testing regimes, there is a public perception that commercial interests are not necessarily in the best interests of public safety.

As a result of changing regulatory requirements, the number and type of scientific studies important to the tobacco and nicotine industry has changed substantially over the past few years. Historically the predominant focus was on analytical chemical methods to assess cigarette emissions. However, with the introduction of the Tobacco Control Act in the United States (3) and its public health standard concerning both individual risk and population risk, a set of new scientific studies are required. While commonplace in some other sectors, studies on abuse liability, risk perception, and comprehension are required prior to launch for some of the regulated pathways to obtaining a marketing order through the FDA. Relatively uncommon to other sectors is the need to develop population models that predict
the long-term impact of the introduction of a new product on both product users and non-users.

There are, as yet, no standardised and regulatory accepted methods for testing the addictiveness, attractiveness, or the toxicity of tobacco and nicotine products (4,5). Even in pharmacokinetic studies of nicotine uptake, results can vary dramatically depending on the protocol and the volunteer participants (6,7). While there are adaptations of standardised regulatory tests such as the Ames test, these give limited insights into toxicity. 21st Century toxicological approaches that are being adopted by some regulators (8) have the advantage of giving better insights and substantially reducing the historic reliance on animal tests. The use of systems toxicology and systems biology may become more important, as will the development of biomarkers of biological effect that could predict disease risk in shorter periods than the time it takes to develop chronic diseases.

So, there is no better time for the industry to consider ways in which it might collaborate within itself and with other parties on developing standardised testing regimes for a wide range of end-points.

Industry collaboration in other sectors

(a) Collaboration through Standards Organisations

In virtually all sectors the concept of developing consensus standards with industry and others is accepted. Indeed, this is the way of working for ISO. ISO lists a large number of “Organizations in co-operation with ISO,” including as examples many industry collaborative bodies such as the Toy Industries of Europe, the European Federation for Precast Concrete, the Personal Care Association and the European Federation of Pharmaceutical Industries and Associates alongside civil society groups (such as the Framework Convention Alliance in the tobacco sector), learned societies, and other expert groups.

As ISO notes “It started with the obvious things like weights and measures, and over the last 50 years has developed into a family of standards that cover everything from the shoes we stand in, to the Wi-Fi networks that connect us invisibly to each other.” (9)

Addressing all these and more, International Standards mean that “consumers can have confidence that their products are safe, reliable and of good quality. ISO’s standards on road safety, toy safety and secure medical packaging are just a few of those that help make the world a safer place.” (9)

ISO state that regulators and governments count on ISO standards to help develop better regulation, knowing they have a sound basis thanks to the involvement of globally-established experts.” (9)
ISO develops standards through Technical Committees (TCs) and recommends broad stakeholder participation where available. For example, ISO TC 34, working on Food Products, has 74 participating members, 64 observing members and 23 international organisations with Liaison status, and has developed around 840 published ISO standards. The members of TCs are national standards organisations from around the world. For example, The American National Standards Institute (ANSI) describes itself as being; “comprised of a broad range of businesses and industrial organizations, standards setting and conformity assessment bodies, trade associations, labor unions, professional societies, consumer groups, academia, and government organizations for the purpose of enhancing global business competitiveness and improving the quality of life for the world's citizens.”

It is commonplace for national standards organisations to invite industry experts to help in the development and validation of new standards.

(b) International harmonisation
In the pharmaceutical sector there are many good examples of industry non-competitive collaboration. The International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH) brought together the regulatory authorities and pharmaceutical industry to discuss scientific and technical aspects of drug registration. Since its beginnings in 1990, ICH has gradually evolved in response to an increasingly global footprint of drug development. ICH’s stated mission is to achieve greater harmonisation worldwide to ensure that safe, effective, and high quality medicines are developed and registered in the most resource-efficient manner (11).

Harmonisation of regulatory requirements was pioneered in Europe in the 1980s, as the European Community moved towards the development of a single market for pharmaceuticals. The success achieved in Europe showed that harmonisation was feasible. While discussions were held between Europe, Japan and the US on possibilities for harmonisation, it was a meeting of the WHO Conference of Drug Regulatory Authorities (ICDRA), in Paris, in 1989, that brought plans to life. This resulted in the authorities approaching the International Federation of Pharmaceutical Manufacturers and Associations (IFPMA) to discuss a joint regulatory-industry initiative on international harmonisation (11).

The Terms of Reference resulted in separating the efforts for harmonisation between Safety, Quality and Efficacy to reflect the three criteria which are the basis for approving and authorising new medicinal products (11).

The initiative continues to progress, and agreement was gained that clinical trials run under Good Clinical Practice conducted in one ICH region could be used in
other ICH regions in 2016, and GCP (R2) reflected on the emerging increase in multi-centre studies and the need for adequate oversight (11,12).

After a series of international food safety issues in the 1990s (for example, BSE, Dioxins, Listeria) and to address a lack of consistency of standards and food industry safety assurance procedures, the Global Food Safety Initiative (GFSI) was established by the CEOs of the world’s food retailers (13). They worked together through their independent international network CIES - The Food Business Forum, now the Consumer Goods Forum (CGF). The GFSI has 4 objectives:

1. Reduce food safety risks by delivering equivalence and convergence between effective food safety management systems.
2. Manage cost in the global food system by eliminating redundancy and improving operational efficiency.
3. Develop competencies and capacity building in food safety to create consistent and effective global food systems.
4. Provide a unique international stakeholder platform for collaboration, knowledge exchange and networking.” (13)

The approach taken was to establish benchmarking for food safety certification programmes such as the UK British Retail Consortium Food Safety Standard that was first introduced in 1998, the International Food Standard (IFS) developed in Europe and the Safe Quality Food (SQF) Standard developed in North America (14,15).

GFSI has developed to become more than just a benchmarking organisation. Its collaborative approach sees international food safety experts from the entire supply chain meet at Technical Working Group and Stakeholder meetings, conferences, and regional events. The key purpose is stated as sharing knowledge and promoting a harmonised approach with a shared vision of safe food for consumers everywhere. (13)

(c) Collaborations on specific health issues
Some consortia have been set up to tackle specific disease issues. One example is not-for-profit charities such as the Dementia Consortium (16). The Consortium is a cross-sector drug discovery collaboration between Alzheimer’s Research UK, MRC Technology and the pharmaceutical companies Eisai, Lilly and Astex. The major companies are said to contribute knowledge, resources, and capital investment to help fund projects. The consortium states that by bringing expertise and providing focused investment, the gap between academic research and the pharmaceutical industry can be bridged in the search for drugs that slow the development of neurodegenerative diseases that cause dementia.
Tackling the issue of tropical disease, a consortium was established, WIPO Re:Search (17), to accelerate discovery and development of medicines, vaccines and diagnostics for neglected tropical diseases. Sponsored by the World Intellectual Property Organization (WIPO), the consortium includes pharmaceutical companies, leading research institutions and nongovernmental organizations. In this example, the member organisations provide intellectual property and expertise on a royalty-free basis to qualified researchers across the global health research community who focus on neglected tropical diseases. Products developed using WIPO Re:Search data are given royalty-free licenses when distributed in least developed countries.

(d) Collaborations with learned societies
Learned societies can also play a role in bringing common ground to marketplace competitors. For example, the American Chemical Society’s Green Chemistry Institute Pharmaceutical Roundtable sees member companies who are part of the ACS GCI Pharmaceutical Roundtable come together to look at new ways to improve process efficiency and product quality through green chemistry and engineering. By working together, the Roundtable is said to provide leadership and influence throughout the industry and supply chain (18).

More broadly focused, the ACS Green Chemistry Innovations forum seeks to connect the Green Chemistry community, from businesses seeking innovative solutions to inventors seeking to find applications for their technologies (18).

(e) Collaborations on new technologies
Consortia have been formed between companies in an industrial sector as a response to a common need. For example, the Open Automotive Alliance (19) is a consortium of automotive manufacturers (such as Audi, Fiat and Ford) and technology companies (such as LG and Google) with a goal of bringing the Android platform into cars in a safe and efficient way.

In another automobile example, German car manufacturers joined to form a company, “Here”, which captures location content such as road networks, buildings, parks and traffic patterns. It then sells or licenses that mapping content, along with navigation services and location solutions to other businesses such as Alpine, Garmin, BMW, Oracle and Amazon. (20)

In pharmaceuticals, ICH was deemed successful and has encouraged the sector to take a variety of additional initiatives. For example, the International Consortium for Innovation and Quality in the Pharmaceutical Sector (IQ) is a not-for-profit organization of pharmaceutical and biotechnology companies with the mission of advancing science and technology to improve the capability of member companies with the stated aim of developing transformational solutions that
benefit patients, regulators and the broader R&D community. Members include major pharmaceuticals such as Pfizer and Astra-Zeneca and smaller focused companies such as Seattle Genetics, specialists in antibody drug conjugate cancer therapies (21).

The Organization for Economic Collaboration and Development (OECD) is the host sponsor for an international effort to develop Adverse Outcomes Pathways (AOPs) (22). Organisations, including industry, agree to host and develop an AOP for a specific disease outcome, and then through the contributions of anyone connected into the system and under the governance of the OECD, the AOPs are improved and developed further. Once developed the key events on the pathways can be evaluated through specific in vitro models, which in turn can evolve into methods for evaluating the potential risks of new products. In a similar approach, IBM’s Improver, supported by Philip Morris International, uses internet crowdsourcing to improve and validate the networks in systems biology models (23).

Industry collaboration from the perspective of the regulator
As can be seen in the above, many of the consortia developed by various sectors have a contribution from regulators, and are responsive to either societal or regulatory needs. From a regulator’s perspective, there are many advantages in having the sector it regulates work in consort on issues it would like to have addressed. Consortia help with efficiency of resources and speed and also allow regulators to consider one solution rather than having to decide between several presented by different members of a particular industry.

Elements of successful collaborations
Although the above gives just some examples of successful collaborations involving industrial sectors, some general themes emerge. The collaborations arise from a clear purpose, whether that be the acceleration of Green Chemistry or the introduction of international standards for food safety. They often involve regulators or government bodies such as standards organisations and, although industrial members are involved, they tend to be contributors of expertise and, on occasion, funds. A clear governance structure is often seen as important, as is the openness of the initiatives to a wide range of contribution and transparency on the goals and work of the collaborations.

Tobacco and nicotine industry current collaborations
(a) CORESTA
CORESTA has had a long-standing role as a forum where organisations involved in tobacco and its derived products (manufacturers, suppliers, associations, academia and regulators) can work together on the development and validation of testing methods, tobacco breeding programmes, and Good Agricultural Practices.
Historically, the focus of the testing method development was internal to industry standardisation, such as production quality-related requirements for physical and chemical testing and approaches to evaluating agrochemical residues on tobacco. More recently focus has broadened to include methods for the expanding lists of toxicants that are required to be measured by regulators and machine puffing regimes and liquid/aerosol constituents for electronic cigarettes (24).

CORESTA was founded on resolutions clearly stating “that a close, concrete and permanent cooperation be achieved between the various sectors of study concerning tobacco” and “that the reference systems be unified [and] analytic methods standardised.” (25) The association sets out to respond to and resolve the non-competitive issues associated with tobacco and tobacco-derived product manufacture, testing and use.

In 1956 the 24 founding organisations were predominantly European state tobacco monopolies and other government organisations. The current member organisations represent a more diverse range of stakeholders and reflect changes in the industry. Privatisation of state monopolies and subsequent mergers have changed the picture on the cigarette manufacturing side. In addition, tobacco growers, chemical, paper and filter suppliers, and providers of test and production equipment/services have joined CORESTA. Most recently membership growth has been driven by manufacturers and suppliers of e-cigarettes and e-liquids as well as independent testing organisations.

Altogether, the members share knowledge and experience, cooperate in collaborative studies, and supply components, equipment and resources to produce CORESTA Recommended Methods (many of which have become ISO Standards, the process being initiated either by national standards bodies or CORESTA), Guides, Technical Reports, and other material presented at CORESTA meetings and made publicly available on the CORESTA website (www.coresta.org).

CORESTA also has working groups on, for example, the development of standardised methods for in vitro toxicological testing of tobacco and nicotine products, and the measurement of biomarkers of exposure to toxicants.

(b) Standards Organisations
ISO Technical Committee TC 126 focuses on tobacco and tobacco products and has 32 participating members, 29 observing members, as well as eight Liaison Organizations, including CORESTA, the European Commission, the Framework Convention Alliance, the World Customs Organization, and the WHO. Over the years, it has published 67 ISO standards, 43 of which are the direct responsibility of TC 126, and is currently working on a further 23. The secretariat is the Deutsches
Institut für Normung (DIN), the German standards organisation, and other members are national standards organisations, including Brazil, India, Russia and China (26).

In 2015 ISO TC 126 established a sub-committee on vapour products in response to a proposal from the Association Française de Normalisation (AFNOR), and is working on issues such as the performance specification for an analytical vaping machine which will underpin analytical methods for the testing of the emissions from e-cigarettes and on an analytical method for determining the major substances in e-liquids. BSI and AFNOR were the first to introduce national standards for vapour products, namely a publicly available specification (27) and three national standards (28) respectively. The work of these national bodies has now progressed into the pan-European standards organisation CEN (European Committee for Standardisation) which has established Technical Committee 437 to develop a range of standards for e-cigarettes. Some aspects of this work may be jointly planned with ISO under the Vienna Agreement (29), thus making the standards international.

Another example, but with quite a different model, was the development of standards for the manufacture and contents of Swedish snus. This began with the Swedish Match company developing and publishing an internal voluntary standard, called Gothiatek® (30), which both covered standards for manufacture and set maximum levels for certain constituents. This standard was later adopted by a broader range of manufacturers of snus under the European Smokeless Tobacco Council (ESTOC) trade association and the approach became known as the ESTOC standard. However, this voluntary quality standard is not adopted or required by regulation.

(c) *In vitro* testing
Various initiatives are seeking to drive the replacement of animal testing with *in vitro* models. One of the leaders in this is the Institute for In Vitro Sciences (IIVS) which recently, under an FDA grant for small conferences, hosted a workshop on *in vitro* testing of tobacco and nicotine products with contributions from the tobacco and nicotine industry, *in vitro* model suppliers, academics, and regulators (31).

Similarly, British American Tobacco and Philip Morris International are contributing to the OECD AOP-wiki initiative, working to define two specific adverse outcomes pathways (32).

(d) Consortium on priority ingredients
Responding to Article 6 of the revised European Directive on Tobacco Products (TPD2), an EU expert scientific panel advised that more scientific data was needed
on specific additives used in tobacco products, including studies related to toxicity and addictiveness (33). It suggested that tobacco manufacturers could carry out joint studies to collect the required data.

**Opportunities for further collaborations**
As the breadth of testing required of tobacco and nicotine products increases, there is clearly scope to expand the non-competitive collaborations to cover new fields—whether that be in the development and validation of population models, or the validation of biomarkers of biological effect. Often in these areas, the tobacco and nicotine industry sector will not be the key owners of expertise, so expansion of consortia to include academia and other industrial sectors makes sense if common purpose can be found.

In addition, where new product platforms are emerging, such as in e-cigarettes and tobacco heating products, opportunities exist to develop consensus approaches to testing that can be proposed for formal standardisation through international bodies.

Trust remains critical, so good governance of any initiative with emphasis on openness, transparency and inclusiveness is likely to be important.

**Conclusions**
In common with many industrial sectors, the tobacco and nicotine industry is actively contributing to the development of standardised test methods and protocols for next-generation products. However, the challenges set by regulators to assess the addictiveness, attractiveness and toxicity of both traditional and new products mean that there is a need for an expansion of collaboration to tackle those needs and emerging sciences. This is likely only to be accepted if there is clear purpose in the initiatives, a common need between industry, regulators and society, and good governance of the effort.

**References**
2. European Environmental Agency, Poor European test standards understate air pollution from cars, 19th October 2004
4. European Union, SCENIHR, Attractiveness and Addictiveness of Tobacco Ingredients, 2010
5. CORESTA *in vitro* toxicology testing taskforce, The rationale and strategy for *in vitro* toxicology testing of tobacco smoke, May 2004
20. Here, HERE gets new investors and plans expansion into China”. HERE 360. 27th December, accessed 1st August 2017
28. AFNOR, XP D90-300-1, XP D90-300-2 and XP-D90-300-3, 2016
31. Institute for in vitro sciences, In Vitro Exposure Systems and Dosimetry Assessment Tools for Inhaled Tobacco Products, held April 4-6, 2016 in Bethesda, MD
32. Tobacco reporter, BAT and PMI share award, February 13, 2017
33. Hoet et al, Recommendations to the European Commission implementing a priority list of additives that should have more stringent reporting requirements: the opinion of the Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR), Tobacco Control, Special Communication, published online dx.doi.org/10.
FACTORS AFFECTING MEDIA COVERAGE OF TOBACCO RESEARCH NEWS

Cheryl K. Olson
Cheryl K. Olson ScD, LLC
San Carlos, CA USA

Abstract
Scientific publications with perceived relevance to public health or safety are often picked up by the popular press. The accuracy of such coverage by electronic and print media varies substantially. Reviewing examples of coverage of recent scientific publications on health effects of tobacco, nicotine or e-cigarettes reveals patterns in the quality and nature of press coverage, as well as its apparent motivation. This presentation focuses on the process by which journalists decide whether to cover a health-related news story; common points of confusion that affect quality of coverage (e.g., correlation vs. causation, or statistical vs. real-world significance); and ways that researchers might act to improve the likelihood and quality of media coverage of research.

According to the latest U.S. National Science Board survey about public attitudes and understanding about science and technology, medical news is extremely popular; 59% are “very interested” in medical discoveries—more than any other category of news—with just 5% “not at all interested.”

One topic of growing interest is research on new electronic nicotine delivery systems. Recent reviews of press coverage of e-cigarettes in the U.S. (2) and U.K. (3) suggest there is “much public confusion surrounding the new technology along with controversy regarding its regulation” (2). While useful, these quantitative studies of reporting provide little insight into why some research attracts more interest than others, how to improve the quality and accuracy of such coverage, and how to credibly address the flaws or limitations of research.

This presentation draws from a review of U.S. mass media coverage produced for Pinney Associates of four recent scientific publications on electronic cigarettes or vaping that received significant coverage in the general press. For space reasons, only two of these articles are addressed here. (Although there may be minor differences, in this document I use the terms “e-cigarettes” and “vaping” devices interchangeably.)

The review of the first article’s coverage also looks at the process by which journalists decide whether and how to cover a health-related news story, what makes such coverage more or less effective, and the types of questions that journalists should be asking when assessing such stories.
Story #1: Hidden Formaldehyde
On January 15, 2015, *The New England Journal of Medicine (NEJM)* published a letter titled “Hidden Formaldehyde in E-Cigarette Aerosols” (4) that received global attention. The study measured the output of formaldehyde-containing hemiacetals (a formaldehyde-releasing agent) under laboratory conditions from a commercially available e-liquid when aerosolized by a tank system e-cigarette that used a variable voltage battery.

Formaldehyde is a colorless, flammable, strong-smelling, naturally occurring and common organic compound that can cause irritation of the skin, eyes, nose and throat. In addition to its best-known use as an embalming fluid, formaldehyde is used in many household products including construction materials, glues, paints, fertilizers, pesticides, and permanent press fabrics. It is also a byproduct of combustion, and can be found in cigarette smoke. There is no doubt about its cancer-causing properties given sufficient exposure. In 2014, the National Toxicology Program listed formaldehyde as a known human carcinogen (5).

The “hook” for the news media coverage of the letter was that it appeared to show new links between e-cigarettes and cancer that drew parallels with the well-established link between tobacco cigarettes and cancer. But did the research described in the letter really do that? And did the press report on that research accurately?

Concerns about the *NEJM* study are manifold and include such fundamental issues as validity (Am I measuring what I think I’m measuring?), reliability (Am I doing a good job of measuring the key variables?), and applicability (Is my model an appropriate representation of real-world situations?). For example:

- Are formaldehyde and “formaldehyde-releasing agents” equivalents when it comes to cancer risk?
- Was the voltage the researchers used in their experimental apparatus (5.0V) a realistic stand-in for real-world vaping, especially since formaldehyde-releasing agents were not detected at the more-typical 3.3V level?
- Are the reference levels for tobacco-generated formaldehyde valid and reliable, especially since they do not overlap at one standard deviation around their respective center points?
- Is the change in relative risk (if it exists) misleading because the absolute risk is so low?
- Is voltage of the delivery device the right independent variable? Power may be more useful since it’s more likely to be associated with aerosolized formaldehyde.
Media Headlines for NEJM Story
At first glance—and especially to a non-scientist—the research seemed to show that a person using an e-cigarette would be exposed to approximately five times the amount of formaldehyde (14.4 mg/day vs. 3 mg/day) as a one-pack-per-day tobacco cigarette smoker, thereby challenging the claims that e-cigarettes are “safer” than tobacco cigarettes. In many cases that was, indeed, the headline.

- “Study Links E-Cigarettes to Formaldehyde, Cancer Risk; Research Found E-Cigarettes Produce New Type of Formaldehyde When Heating Nicotine-Laced Liquid” – Wall Street Journal, 1/21/15 (7).
- “Before You Vape: High levels of Formaldehyde Hidden in E-Cigs”—NBC News, 1/21/15 (10).

While those headlines were dramatic, some of the coverage was more nuanced. Many of the pieces featured a statement by Greg Conley, president of the American Vaping Association, calling into question the study’s use of high voltage settings, e.g. “When the vapor device was used at the realistic setting of 3.7 volts, levels of formaldehyde were similar to the trace levels that are released from an FDA-approved [smoking-cessation] inhaler. However, when the researchers increased the voltage to 5 volts and continued to have their machine take three- to four-second puffs, this caused extreme overheating and the production of formaldehyde… These are not settings that real-life vapers actually use, as dry puffs are harsh and unpleasant.” (9)

Media Coverage—CBS This Morning
This combination of an alarmist headline and/or “lede” (first paragraph of a news story) with a scientific perspective on the numbers and risks can be clearly seen in a roundtable set piece broadcast January 21, 2016 on CBS This Morning (11).

This story is a useful exemplar because it combines some of the things that comprise excellent scientific reporting and others that demonstrate inaccurate and even dangerous reporting.

News anchor Norah O’Donnell begins:

There’s a new warning this morning that e-cigarettes may not be as safe as they seem. The New England Journal of Medicine says that e-cigarette users are 5 to 15 times more likely to get formaldehyde-related cancers than long-term smokers. Formaldehyde is the toxic chemical found in the devices.
Dr. Holly Phillips is with us. Dr. Holly, good morning.

Formaldehyde – we think about lab in high school when we were dissecting frogs. That’s in e-cigarettes? How dangerous is it?

At this point, Dr. Phillips tries to put the findings and the fears into perspective.

Formaldehyde is a really common chemical. It’s not only in frogs in biology labs. It’s in permanent press fabrics. It’s in glues. And most importantly, it’s in regular cigarettes. When you smoke a regular cigarette, you inhale the formaldehyde, which we know can cause cancer.

In the study, researchers took a high-power form of e-cigarette—it’s called a tank system—and they basically created a vapor in a lab and studied it. They found that when you heated the vapor up at a low voltage, 3.3 volts, there was very little formaldehyde in it. In fact, none. But when you heated the vapor up at 5 volts, there was a lot of formaldehyde. In fact, two-and-a-half times the amount of formaldehyde that you would get if you smoked a regular cigarette.

News anchor Gayle King then introduces the industry’s perspective:

Well, the American Vaping Association—no surprise—is not happy. They say that the study is flawed. How come?

Dr. Holly Phillips:

Not only the Vaping Association, but a number of critics have come out against this paper that was published in The New England Journal. Basically, they’re saying what happens in the lab doesn’t necessarily happen in real life. And even though they heated up the vapor to a very high voltage (sic) in the lab, real-life e-cigarette users wouldn’t do that.

The vapor would taste terrible. It would basically overheat their device. And they would not enjoy the smoking. They would usually smoke at a lower voltage, which has less formaldehyde.

News anchor Jeff Glor responds:

So they’re saying you’d have to crank up the e-cigarette in some way. That most e-cigarettes, you can’t even do it with to achieve these levels.

Dr. Holly Phillips:

Exactly. They used a specific high-power e-cigarette called a tank system, and so most people wouldn’t be exposed in that way.

Norah O’Donnell:

When are we really going to know if they’re safe right now?
Dr. Holly Phillips:

_Theoretically, they should be safer. We know that the main harm from cigarettes isn't the nicotine, even though that's an addictive substance. It's the 4,000 chemicals, 60 of which we know are carcinogens, that come from burning tobacco._

_E-cigarettes don't burn tobacco. So in theory they should be safer. But as we see today, the jury is still very much out on that._

Jeff Glor:

_Holly Phillips. Thanks very much._

### Deciding to Cover the Story: Points of Contact

Before dissecting this story, let’s take a look at how it likely got on the air at all. Without that process, there would be nothing to examine. Stories like this are usually triggered by a news release—in this case, almost certainly from Portland State University (12) where the research took place. (Since the publication was a letter, not a refereed research article, it’s doubtful that _NEJM_ put it in its weekly outreach to journalists.) Because it was information published in a scientific journal, it would have been embargoed until the evening before the publication date of the print edition of that journal. Although they could not report on it until the embargo date, journalists would have had access to pre-publication copies of the letter, including contact information for the researchers.

Approximately one week before broadcast, that press release would have been received by or made its way to a producer at _CBS This Morning_, who would have pitched it for the “budget” (rundown of stories) of the first show to air after the embargo. The decision made by the producers during that budget meeting would be (1) whether to cover the story at all, (2) how to cover the story, _e.g._, a “reader,” field package, live satellite interview with a researcher, roundtable discussion, etc., and (3) how much time to allocate to it. The producers decided to go with a mid-level approach: a roundtable discussion with one of their in-house medical experts. They allocated two minutes and 30 seconds for the story, which is consistent with that mid-level ranking for a morning news program.

It’s important to note that the three news anchors discussing this story have no training or expertise in science or medicine. (There are times when, from the journalists’ perspective, this is not a problem and may even give them an advantage since it allows them to view news stories from their audience’s perspective, acting as their surrogate.) Nor is it likely that any of the show or segment producers have any significant education in medicine or science, or any experience as a beat reporter/producer covering health issues or science; almost all producers have a “general assignment” background. They decided to bring in Holly Phillips, M.D.,
a board-certified internist and part-time journalist at CBS specializing in health and medicine.

In most cases, the graphics are ordered and assembled by the segment producer, who also writes the lede (read by Norah O'Donnell) and obtains background information and quotes such as the one from the American Vaping Association. The segment producer then briefs the journalist, who may do additional background research, and the anchors, including sharing descriptions of the proposed graphics so that they can allude to the information on them in a timely manner. In a roundtable such as this, everything after the lede is ad libbed. All of the participants, especially Dr. Phillips, will have notes on the key points they’d like to make during the ad lib discussion so that they can make use of the graphics.

It’s critical to understand this process and its correlates among print, online and radio outlets to appreciate that there are multiple points of potential contact that can be used to make the coverage of science-related news more accurate. Also, many of the people involved in screening and structuring health and science stories in all media have no significant training in those fields, and thereby have few ways to analyze the validity, reliability or importance of the data presented to them.

Analyzing the CBS News Story
The CBS story begins with an implicit link to the long-term misleading of the public and the press by the tobacco industry regarding cancer risks, following which that industry essentially lost all of its credibility on health-related matters. The thought that another industry, whether it’s automobile airbags, pharmaceuticals, or laminated flooring, might be misleading the public on the health risks of its products is red meat to most journalists. Such temptation, combined with a lack of sophistication in science and statistics, can easily lead those journalists—even the ones with the best of intentions—and the public astray.

That implicit link helps explain the overall tone of the piece, including the constant bottom-third graphic that reads “Vapor Danger. Study: Hidden Carcinogen Found in E- Cigarettes.” That tone sets the stage for the ominous lede:

The New England Journal of Medicine says that e-cigarette users are 5 to 15 times more likely to get formaldehyde-related cancers than long-term smokers.

Such phrasing implies (inaccurately) to viewers that an august body of physicians (NEJM) has determined that e-cigarettes are inherently life-threatening. In reality, the journal simply published a peer-reviewed letter, not a peer-reviewed article, in which the authors describe an experiment they did and present what they see as its implications.
While it’s useful and appropriate to consider the source of a story (e.g., NEJM vs. a corporate or university public relations office) in an initial screening, most journalists do not appreciate or pay attention to the subtle differences between types of professional journals and types of pieces within those journals. Nor do they appreciate the need for independent replication of findings before they should be generally accepted.

### Key Questions Journalists Should Ask

The producers and anchors should not be expected, by themselves, to know which questions to ask when assessing these types of data. But they should be open to and able to ask those questions when provided guidance by a credible source either inside or outside their newsroom. Those key questions include:

- **Validity:** Are the researchers measuring what they think they’re measuring? (In this case, is the concentration of formaldehyde the same as concentration of formaldehyde-releasing agents?)

- **Reliability:** How good of a job are they doing at making those critical measurements? Is the experiment structured in such a way that others would get the same results using the same protocol? Would the results stay the same if the same researchers repeated the study a month from now?

- **Real-world modeling:** Is the research design a realistic way of simulating what real people who vape do? Is 3ml/day a reasonable estimate of consumption among vapers? Are the authors leaping to unfounded conclusions?

- **Relative risks vs. absolute risks:** Which are we describing? What sounds like a dramatic change in relative risk can be a trivial change in absolute risk. In this study, while the relative risk goes up by a factor of 5 (or even 15 in some models), the absolute risk is still extremely low. Indeed, in its response to the study, the American Council on Science and Health (13) states, “Biologically, as scary as it sounds (embalming fluid) formaldehyde is actually a very weak carcinogen, with only a slightly increased chance of cancer among even highly-exposed workers over an entire lifetime.” In addition, the majority of tobacco cigarette-related cancers are not caused by formaldehyde, but by other carcinogenic compounds that are not present in e-cigarettes. So while the risk of that small subset of cancers may go up, the overall theoretical risk of smoking-related cancers—what the journalists’ audience should be concerned about—would go down dramatically! This also has implications for determining statistical vs. clinical significance.
• **Clinical vs. statistical significance:** Statistical significance, which is often a major component in whether an academic research paper is published, is a matter of calculating the odds that the difference on some variable between two or more groups is due to something other than chance or random variation. Clinical significance in a health-related study is a matter of whether the difference between those variables has an important effect on people’s lives. The two are not always the same.

• **Frame of reference:** Are the risks and benefits couched in appropriate terms with respect to the reference groups? For example, are we comparing cancer rates among vapers to those among tobacco cigarette smokers or to cancer rates among lifetime non-smokers? Are the exposure statistics for tobacco cigarettes and e-cigarettes comparable? In this study, they’re comparing e-cigarette users to tobacco cigarette smokers, which is a valid reference group since e-cigarettes are promoted as a way to quit smoking. But, as noted above, the conclusion about theoretical health risks with respect to that reference group did not cite the overall decline in all smoking-related cancers vs. the increase in formaldehyde-related cancers.

• **Clear definitions:** Are both the technical and general terms used by the researchers clearly and consistently defined? For example, what constitutes a “daily user” of an e-cigarette? What about a “regular user” or an “experimenter”? Do other researchers use those terms in the same way?

• **Appropriate statistics:** Are the researchers using appropriate mathematical techniques to analyze their data? Have others used those same techniques in similar studies?

• **Vested interests:** Do the authors have any vested interests or conflicts of interest that might influence how they gather, interpret or present their results?

Health and science beat reporters—especially those who have professional training in the sciences—routinely ask those and other questions. Unfortunately, most general assignment reporters and producers do not analyze stories and story pitches this way. The *CBS This Morning* story is a case in point. It begins with an ominous statement that sets the viewers’ expectations by using the words “warning,” “cancer” and “toxic”:

*There’s a new warning this morning that e-cigarettes may not be as safe as they seem. The New England Journal of Medicine says that e-cigarette users are 5 to 15 times more likely to get formaldehyde-related cancers than long-term smokers. Formaldehyde is the toxic chemical found in the devices.*

The tone of the piece is reinforced by a full-screen graphic.
Factors Affecting Media Coverage of Tobacco Research News

Dr. Phillips’s initial statement on-air takes a different and more-scientific approach in an attempt to put the audience’s exposure to formaldehyde into perspective and to rein in the credulousness of the anchors:

Formaldehyde is a really common chemical. It’s not only in frogs in biology labs. It’s in permanent press fabrics. It’s in glues. And most importantly, it’s in regular cigarettes.

This temporarily shifts the tone of the piece away from melodrama and begins to explore some of the key questions mentioned above.

Gayle King pivots to the industry comment while expressing her skepticism:

Well, the American Vaping Association—no surprise—is not happy. They say that the study is flawed.

This cynicism about industry sources has profound implications for determining who has credibility on health and science matters with journalists.

Dr. Phillips attempts to buttress the concerns about the researchers’ apparent design flaws:

Not only the Vaping Association, but a number of critics have come out against this paper that was published in The New England Journal. Basically, they’re saying what happens in the lab doesn’t necessarily happen in real life. And even though they heated up the vapor to a very high voltage (sic) in the lab, real-life e-cigarette users wouldn’t do that.

The vapor would taste terrible. It would basically overheat their device. And they would not enjoy the smoking. They would usually smoke at a lower voltage, which has less formaldehyde.

The unnamed critics that she cites are amorphous and therefore lack credibility. The audience does not know if these are reputable scientists, defensive vapers, or public relations flacks.

Jeff Glor responds by recapitulating what Dr. Phillips is saying about the study’s design flaws:

So they’re saying you’d have to crank up the e-cigarette in some way. That most e-cigarettes, you can’t even do it with to achieve these levels.

This is a key point in covering this story: the real-world situation being modeled is unrealistic. Therefore, the conclusions about cancer risk do not appear to be valid. Since we don’t have measurements at voltages other than 3.3V and 5.0V, and we don’t know from this study what voltage a typical vaper uses, we simply don’t know
what the risk from vaping for formaldehyde-related cancers is. Unfortunately, this key point is missed in the exchange at the end of the story:

Norah O’Donnell:

*When are we really going to know if they’re safe right now?*

Although it’s awkwardly phrased, this is the most important question to the viewers: What light does this study shed on the absolute dangers of using e-cigarettes and their relative dangers when compared to tobacco cigarettes? Dr. Phillips responds:

*Theoretically, they should be safer. We know that the main harm from cigarettes isn’t the nicotine, even though that’s an addictive substance. It’s the 4,000 chemicals, 60 of which we know are carcinogens, that come from burning tobacco.*

*E-cigarettes don’t burn tobacco. So in theory they should be safer. But as we see today, the jury is still very much out on that.*

Everything in her comments is accurate until that last line. The research they reported on did not confirm that “the jury is still very much out” on e-cigarette safety. It was a flawed study that was treated by the anchors and the graphics as if it signaled a dramatic increase in cancer risk when it did nothing of the sort.

**Media Coverage – National Public Radio**

National Public Radio’s *Morning Edition* ran a piece by Rob Stein on the *NEJM* formaldehyde story. (14) Stein is the senior editor on that network’s science desk who’s spent most of his career covering medicine and science for newspapers and broadcast media. While he was more circumspect, he also indulged in a bit of melodrama and missed some key issues.

Renee Montagne, host:

*Here’s something to think about when taking a puff of an e-cigarette—formaldehyde. New research is raising more concern about the safety of electronic cigarettes, finding the vapor they produce contains more formaldehyde than previously reported. NPR’s Rob Stein has this story.*

Rob Stein:

*E-cigarettes work by heating up a liquid that contains nicotine. That makes a vapor that users inhale. It’s called vaping. E-cigarettes are generally considered safer than tobacco cigarettes, but David Peyton of Portland State University and his colleagues decided to take a closer look at what’s in that vapor.*
Dr. David Peyton:

We simulated vaping by drawing the vapor—the aerosol—into a syringe, sort of simulating the lungs... (e)

To our surprise, we found a form of formaldehyde in e-cigarette vapor.

Rob Stein:

A form that might make it easier for formaldehyde to slip into someone's lungs. And they didn't just find a little formaldehyde; they found a lot.

Dr. David Peyton:

We found this form of formaldehyde at significantly higher concentrations than even regular cigarettes—between five and 15 fold higher concentration of formaldehyde than in cigarettes.

Rob Stein:

And formaldehyde can be nasty.

Dr. David Peyton:

Long-term exposure is recognized as contributing to lung cancer and so we would like to minimize, to the extent one can, contact with formaldehyde, especially delicate tissues like lungs.

Stein does a good job of quickly explaining how e-cigarettes work and that they're generally considered to be safer than tobacco cigarettes. He reached out to one of the study's authors to get greater insight. However, that author's statement, “To our surprise, we found a form of formaldehyde in e-cigarette vapor” strains credibility given the researchers' backgrounds in chemistry. While the quantity of formaldehyde released at different voltages may have been surprising, its presence should not have been given the composition of the e-liquid they were heating. It makes it sound all the more frightening, as if formaldehyde was a hidden and unexpected threat.

Rob Stein:

For their part, companies that make e-cigarettes are dismissing the study. Gregory Conley of the American Vaping Association says the researchers only found formaldehyde when the e-cigarettes were cranked up really high.
Gregory Conley:

“No real-life human is ever going to vape at that setting throughout the day because after a couple puffs, they’d be unable to puff anymore. They would take the vapor product and take a puff for one second and it would burn. Not burn like a third-degree burn, but it would feel extremely unpleasant in your lungs.”

By including only an industry representative, Stein is setting up the story as “science vs. industry,” ignoring some of the serious questions other scientific researchers have about the experiment and the interpretation of its results. This skews the information in favor of the NEJM letter’s authors, even if that’s not warranted.

Conley then questions the applicability of the experimental design to real-world vaping and follows that soundbite with his charred steak analogy:

“I can take a steak and I can cook it on the grill for the next 18 hours, and that steak will be absolutely chock-full of carcinogens. But the steak will also be charcoal, so no one will eat it.”

Rob Stein:

“Peyton, the researcher, acknowledges that he found no formaldehyde when the e-cigarettes were set low. But he says he thinks plenty of people are using the high settings.”

Dr. David Peyton:

“As I walk around town and look at people using these electronic cigarette devices, it’s not difficult to tell what sort of setting they’re using. You can see how much of the aerosol they’re blowing out. It’s not small amounts. It’s pretty clear to me that at least some of the users are using the high levels.”

Rob Stein:

“Peyton hopes the government will limit the sale of these devices, especially to kids. The Food and Drug Administration is in the final stages of trying to decide how strictly the agency will regulate electronic cigarettes.”

Rob Stein, NPR News.

Peyton’s claim that he can “tell what sort of setting [vapers are] using” is unsubstantiated and questionable. It should be challenged.

Media Coverage – Reuters

Toni Clarke, a biotechnology reporter for Reuters, did an excellent job of covering the story on January 21, 2015 (15). She begins:
Ramping up e-cigarette voltage produces more formaldehyde—study

People who smoke high-voltage e-cigarettes have greater exposure to formaldehyde, a suspected carcinogen, than those who keep the voltage low, according to a study published in the New England Journal of Medicine on Wednesday.

The study, which critics say is misleading and lacks context, is the latest contribution to a debate on the safety of e-cigarettes that so far has yielded little long-term data, though most experts believe they are less toxic than combustible cigarettes…

After explaining the underlying science and the research design, Clarke then does something basic that the other reporters cited above failed to do: she speaks with both a researcher who wrote the *NEJM* letter and other researchers in the field to clarify some issues. Her interview with coauthor Dr. James Pankow brings to light some very important limits to interpreting the findings that were missed by other press reports.

*It is not known exactly where formaldehyde contained in hemiacetals gets deposited in the body or whether it is similarly toxic,* said James Pankow, one of the study’s authors.

“There has never been a cancer study with hemiacetals,” Pankow said in an interview.

*Absent such a study, the authors estimated the formaldehyde-related cancer risk associated with e-cigarettes by extrapolating from data on formaldehyde in cigarettes.*

This is the essence of strong science reporting: clarity not only about the research but also about its limits and implications. Hemiacetals may not be a valid surrogate for aerosolized formaldehyde. Extrapolated risk may not translate from one chemical to the other. Relative overall cancer or health risk may be more important than absolute formaldehyde-related cancer risk.

What’s particularly powerful is that these challenges to the interpretation of the results of the study come not from industry representatives, who would be perceived to have a financial interest in a particular outcome, but from other researchers who are professional peers of the authors: Dr. Jed Rose, director of the Center for Smoking Cessation at Duke University Medical Center, Dr. Neal Benowitz, a nicotine expert at the University of California, San Francisco, and Dr. David Abrams, executive director of the Schroeder Institute for Tobacco Research and Policy Studies at the anti-tobacco group Legacy. Each of these commentators brings with him the imprimatur of his institution, giving greater weight to their statements and therefore greater credibility and usefulness to the reporter’s piece.
Story #2: Flavored E-Cigarettes and Youth
On November 7, 2016, the journal *Pediatrics* published a study by Hongying Dai and Jianqiang Hao (16) on “Flavored Electronic Cigarette Use and Smoking Among Youth.” Their paper used data from the 2014 National Youth Tobacco Survey (NYTS) (17) an annual questionnaire given to students in grades 6-12 who comprise a representative sample of students that age throughout the country. (Note that children who drop out of school in those grades are significantly more likely to use tobacco products than children who are still in school, so the sample may not be representative of the overall population when it comes to smoking and vaping.)

A logistic regression model was used to assess whether flavored e-cigarette use was associated with (1) intention to initiate cigarette use among never-smoking youth \( n=16,471 \), (2) intention to quit tobacco use among current-smoking youth \( n=1,338 \), and (3) perception of tobacco’s danger among all respondents \( n=21,491 \). (16)

Logistic regression is a way of combining several independent variables in an attempt to predict a dependent variable that’s categorical, e.g., alive/dead, smokes/doesn’t smoke, diagnosis of Disease A/Disease B/Disease C.

Concern is growing that widespread availability of flavored e-cigarettes will increase the use of e-cigarette products by youth and will thus reinforce the acceptability of vaping behavior. The normalization of e-cigarette use among youth could also lead to e-cigarettes becoming a gateway for future smoking, marking a setback in the decades-long antismoking battle. (16)

This is a “hot button” issue for journalists as well as public health advocates. If we embrace harm reduction by promoting e-cigarettes as a way of quitting tobacco cigarettes, are we unintentionally luring children who otherwise wouldn’t smoke tobacco to start vaping, thereby increasing their health risks? Or are children (or most of those children) who vape the ones who otherwise would have taken up smoking tobacco cigarettes, and are thereby reducing their health risks—although not as much as they would have by abstaining completely?

Media Coverage – Reuters
Kathryn Doyle, a health reporter for Reuters, picked up on this research in an article published on November 7, 2016 titled “Kids Who Use Flavored E-cigs More Likely to Want to Try Cigarettes.” (18) It begins:

*U. S. kids who use flavored e-cigarettes more often intend to start smoking traditional cigarettes than kids who did not use flavored vapes, according to a 2014 national survey.*
A few paragraphs down, however, she interviews another researcher who questions the conclusions implied by the headline.

“This study does not show e-cigarettes are definitely a gateway to smoking cigarettes,” said Shu-Hong Zhu, principal investigator of the California Smoker’s Helpline, who was not part of the new study. “It shows that students who tried e-cig are more interested in cigarettes than students who have not tried e-cig,” but is not sure evidence of a gateway from one to the other.

In other words, the Dai and Hao study confuses correlation with causation. It may be, for example, that students who are interested in smoking tobacco cigarettes are more likely than non-smokers to want to try e-cigarettes for reasons that influence both decisions.

**Media Coverage – HealthDay News**

On November 7, 2016, HealthDay News, a syndication service specializing in medical stories, published a piece by Steven Reinberg titled “Flavored E-Cigarettes May Entice Teens to Smoke.” (19) It leads with:

*Fruit- or candy-flavored electronic cigarettes may entice American teens to start smoking tobacco, a new study suggests.*

... *Due to a proliferation of e-cigarette flavors on the market, flavored e-cigarette use among youth in the U.S. has increased significantly,* study author Hongying Dai said. She’s an associate professor of health services and outcomes at Children’s Mercy Hospital in Kansas City.

That first statement is a confusion of correlation with causation. So is the second. (Do we know that the number of youth trying e-cigarettes is “due to a proliferation of e-cigarette flavors?” Or were the range of flavors developed to capture segments of the e-cigarette using population?)

The second statement is also a distortion due to confusing absolute numbers with relative numbers or ratios. The modern e-cigarette was invented in 2004 (20). It has only been marketed nationally for a few years. As with any successful new product, we would expect its use to increase significantly because the denominator (the absolute number of youth vaping) in that ratio starts at a low number. Since its base rate (reference point) is so small, any growth is exaggerated when expressed in those terms.

For example, the US Centers for Disease Control and Prevention issued a press release (21) in April 2015 with the headline “E-cigarette Use Triples Among Middle and High School Students in Just One Year.”
On its own, that sounds terrifying. But a few sentences into the release we learn that the dramatic percentage jump is due to two things: a broad definition of e-cigarette use and a low reference point. Current use was defined as at least one puff in the previous 30 days, thereby including those students who experimented with and rejected e-cigarettes. Among middle school students, the “current use” rate went from 1.1 percent in 2013 to 3.9 percent in 2014.

There’s another likely reason for the dramatic jump: the survey questions changed. For example, in 2013 the NYTS question about use of “other forms of tobacco” during the previous 30 days was:

<table>
<thead>
<tr>
<th>37. In the <strong>past 30 days</strong>, which of the following products have you used on at least one day? (You can <strong>CHOOSE ONE ANSWER or MORE THAN ONE ANSWER</strong>)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Roll-your-own cigarettes</td>
</tr>
<tr>
<td>B) Flavored cigarettes, such as Camel Crush</td>
</tr>
<tr>
<td>C) Bidis (small brown cigarettes wrapped in a leaf)</td>
</tr>
<tr>
<td>D) Clove cigars (kreteks)</td>
</tr>
<tr>
<td>E) Flavored little cigars (such as mint, clove, spice, alcohol (wine, cognac), candy, fruit, chocolate, or other sweets)</td>
</tr>
<tr>
<td>F) Smoking tobacco from a hookah or a waterpipe</td>
</tr>
<tr>
<td>G) Snus, such as Camel or Marlboro Snus</td>
</tr>
<tr>
<td>H) Dissolvable tobacco products, such as Ariva, Stonewall, Camel orbs, Camel sticks, or Camel strips</td>
</tr>
<tr>
<td>I) Electronic Cigarettes or E-cigarettes, such as Ruyan or NJOY</td>
</tr>
<tr>
<td>J) Some other new tobacco products not listed here</td>
</tr>
<tr>
<td>K) I have not used any of the products listed above or any new tobacco product in the last 30 days</td>
</tr>
</tbody>
</table>

In 2014, that question was changed to:

<table>
<thead>
<tr>
<th>35. In the <strong>past 30 days</strong>, on how many days did you use electronic cigarettes or e-cigarettes such as Blu, 21st Century Smoke, or NJOY?</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) 0 days</td>
</tr>
<tr>
<td>B) 1 or 2 days</td>
</tr>
<tr>
<td>C) 3 to 5 days</td>
</tr>
<tr>
<td>D) 6 to 9 days</td>
</tr>
<tr>
<td>E) 10 to 19 days</td>
</tr>
<tr>
<td>F) 20 to 29 days</td>
</tr>
<tr>
<td>G) All 30 days</td>
</tr>
</tbody>
</table>
Indeed, the CDC admits that this might be the case in an article in *Morbidity and Mortality Weekly Report* (22) about the survey’s methodology:

> Changes between 2013 and 2014 in the wording and placement of questions about the use of e-cigarettes, hookahs, and tobacco pipes might have had an impact on reported use of these products.

A quote from Greg Conley in the HealthDay News piece called Dai and Hao’s research design into question for yet another reason:

> “In this study, any teen who answered ‘probably not’ when asked if he or she thought they would smoke a cigarette in the next year was marked as ‘intending to smoke,’” said Gregory Conley, a spokesman for the American Vaping Association.

> Only a small number of participants answered “definitely” to the cigarette smoking question, Conley said. “So in order to give themselves statistical power, the researchers enlarge the category to include ‘probably not,’” he said. (19)

This is a recurring issue in scientific research. Even though their value to science may be the same, journal editors are much more likely to publish articles in which the findings show a statistically significant difference of some sort. That puts pressure on researchers to design their studies to show some type of statistical significance, even if it’s an inappropriate or suboptimal design.

The piece ends with a quote from Dr. Stanton Glanz of the University of California at San Francisco, who is a strong advocate of the abstinence approach.

> “This reality makes the fact that the Obama White House dropped regulation of flavors, which especially appeal to kids, from the FDA’s recent rule taking jurisdiction over e-cigarettes worrisome,” Glantz said. “The effect of this deletion will delay regulation of flavors in e-cigarettes by years, leading more kids to get addicted to nicotine,” he said. (19)

This once again conflates the supposed dangers of nicotine with the well-established and far-worse dangers of smoking tobacco.

Coverage of this *Pediatrics* article was an interesting case study in the translation of an academic paper into journalism for the lay public. The intersection of health risks and teenagers is always a provocative topic. Fruity flavors, perhaps because of their association with even younger children, would normally make this subject matter catnip to reporters and editors.

Given the press response to earlier studies of e-cigarettes as “gateway drugs” to tobacco cigarettes, this research received comparatively little coverage—probably
due to its publication online on November 7, 2016, one day before the U.S. presidential election. The study was simply overshadowed by more pressing issues.

Common Errors In News Coverage
In sum, while some of the reporting on tobacco research was clear, practical and evocative, other media interpretations had repeated and predictable patterns of distortions, poor interpretation and missed opportunities. These problems included:

- **Alarmism.** With the NEJM study coverage, many reporters latched onto the implicit and explicit dangers of aerosolized formaldehyde without putting those dangers into a useful (and calming) context. Such key words as “cancer” and “cigarettes” appear to have contributed to this, as did the association of formaldehyde with embalming fluid, and therefore death. Very few reporters paid close attention to the potentially positive finding of no detectable level of formaldehyde in the low-voltage condition, which is the setting used by many vapers, especially those who use single-voltage systems.

- **Credulity.** Most reporters either didn’t have the knowledge or felt it inappropriate to question the findings of the research. Non-specialists also showed little understanding of the nature of scientific research, viewing the results of a single experiment or survey as a kind of immutable truth rather than a step toward greater understanding that should be challenged to determine its robustness. Such constant challenging is at the heart of science and drives progress.

- **Poor choice of interview subjects.** Many journalists simply reached out to a small number of industry spokespeople or public health advocates. The best reporters not only reached out to the original researchers for clarification of details and interpretation, they also contacted other researchers who specialized in this field but had no financial ties to industry. Such scientists are seen as experts and credible peers of the original researchers, and their concerns or support are given greater weight by readers/viewers/listeners.

- **Failure to acknowledge constraints of the study.** Most studies are narrowly focused, but the reporting on them often presented them as broad or generalizable. The journalists’ interpretation of the study’s results and implications often went well beyond the actual data.

- **Not specifying reference groups.** In multiple reports, words like “healthier” and “riskier” were used without specifying healthier than whom or riskier than what. There was also a confusion of absolute risk with relative risk.

- **Hidden motives.** This is often thought of in terms of industry spokespeople wanting to promote their products and downplay any risks, or researchers wanting to burnish their reputations or get tenure at their university. But there are others, including conflicts of interests by journalists or news outlets. For example, the local news website CapeCod.com ran a feature
Factors Affecting Media Coverage of Tobacco Research News

story on November 23, 2015 titled “Do E-cigarettes Help You Quit Smoking?” (23) that linked to the NEJM article.

Although it’s not obvious at first glance, the piece is simply a reprint of a press release issued by Cape Cod Health News, which is owned by Cape Cod Healthcare (CCHC). CCHC owns two hospitals and manages the practices of 450 physicians in Cape Cod, Massachusetts. Thus, the main purpose of Cape Cod Health News is to provide a venue for promoting its physicians and services, not to provide the most accurate health information. This is not made clear to the reader. But it does explain why the two physicians (a cardiologist and an emergency physician) who commented on the study were not appropriately qualified experts in the fields in which they expressed their opinions. They were selected because of the CCHC-employed writer’s mandate to burnish the image of the CCHC hospitals.

- **Beat and general assignment reporters tend to cover these stories differently.** Those journalists who have expertise in science or medicine tend to view research results more skeptically and to ask questions that challenge that research. General assignment reporters tend not to challenge researchers’ methods or conclusions.

The news media want to get it right. There’s no long-term incentive for journalists to distort their coverage of science stories. But as demonstrated in the examples above, news media of all types have difficulty covering complex health and science-related topics accurately and insightfully for a variety of reasons. Here are some key points to keep in mind:

- **Many of the reporters/producers/editors charged with interpreting these stories have little or no formal training or experience in science and mathematics, which may result in their being inappropriately credulous or alarmist, and which makes it more difficult for them to put research findings into an appropriate perspective. Those who have significant professional experience and/or academic training in health or science tend to approach covering scientific research differently than those who are general assignment reporters and cover these fields infrequently.**

- **Stories tied to smoking—and especially tied to smoking and cancer—are tainted by the history of misrepresentation of scientific data on risk to the media and to the public by the tobacco industry. This predisposes journalists and the public to assume that all smoking- and vaping-related products have similar health risks, when that’s not true. People tend to act based on their emotions, not on their logical thoughts. This is a constant challenge in the coverage of health-related topics.**

- **Industry representatives and spokespeople have little credibility when it comes to discussing the health risks of their products, even when they have independently gathered data to back up their claims. They are called upon to comment because it’s easy to reach them and it provides support**
for a claim of balanced coverage. There's no resource not controlled by the industry that helps reporters make sense of this research.

- **Protecting children from new technologies, whether it's video games or e-cigarettes, because of their unsubstantiated but purported dangers has shown itself to be a powerful political bandwagon.** No one wants to be accused of being against children's safety. This makes a practical *harm reduction* approach (e.g., getting teenagers who smoke tobacco to switch to vaping) less emotionally attractive than an impractical *harm elimination* approach (e.g., get teenagers who smoke tobacco to quit completely). Many of those who promote harm elimination position that approach as if it's an easily achievable state, which it is not. In fact, it's likely impossible. Adolescents are biologically driven to take risks as a way of testing adulthood and establishing their independence (24).

- **There are times when media outlets confuse accuracy with the appearance of balance.** In the *CBS Morning News* story, for example, we have no doubt that the journalists strove for accuracy. The problem was that most of them didn't have the expertise and perspective to know what questions to ask that would help explicate the study. In their efforts to achieve accuracy, they looked for balance. In this case, it meant getting a comment from a group that was bound to disagree with the researchers’ conclusions: a representative of the vaping industry. The grudging quality of this attempt at balance is shown by Gayle King’s statement, “Well, the American Vaping Association—no surprise—is not happy.” Obtaining this type of industry comment does not improve the accuracy of the science news story in part because *the source of that information is inherently perceived as tainted, even when the information is independently gathered and accurate*. Although the formaldehyde study was published as a letter to the editor and not as a full peer-reviewed article, it carried with it the imprimatur and gravitas of *The New England Journal of Medicine*. A spokesperson for an industry group or corporation has no such weight behind his or her words.

- **Even when journalists try to achieve balance, they sometimes do so by creating false equivalencies.** This is most obvious when journalists covering emotionally charged issues such as evolution, which has been agreed upon by the vast, vast majority of scientists for decades, feel obligated to obtain a countering quotation from a non-scientist who claims that the Earth is only 6,000 years old and was created in seven days. Such false equivalencies run counter to the scientific method.

We should be concerned about false equivalencies involving the health risks of vaping. We should especially be sensitive to the differences between absolute risk and relative risk. No one can legitimately claim that vaping is risk-free. There is significant evidence, however, that vaping carries fewer health risks and different health risks than smoking tobacco. It's
unrealistic—a false equivalency—to assume that no one will take any type of drug that alters their state of consciousness. Yet that position of total abstinence is often used unquestioningly as the reference point for assessing potential risk of a substance or product.

- **There are multiple points of contact within news media that can be used to improve the accuracy of news coverage of scientific research.** Using the example of the formaldehyde related cancer story reported by *CBS This Morning*, the program producer, the segment producer and the beat reporter each had considerable influence in how that information was presented. In other media, the contact person might be an assignment editor or a health editor.

**Conclusion**

There are several things that those involved in noncombustible nicotine delivery products can do to improve the quality of science news reporting in this area:

- **Focus on improving accuracy of reporting rather than just burnishing image or boosting sales.** Remember the lessons learned by the tobacco industry when it undermined its own credibility by hiding and distorting data. If you’re perceived as simply pushing a self-dealing agenda, you will not be listened to.

There are times when research studies will point to increased risks, problems and other negative effects. These are to be expected; no product or procedure is perfectly safe and effective. But industry spokespeople and researchers must maintain their credibility with journalists if they are to help put these stories into perspective. Let’s say, for example, that a new and well-designed study finds that the theoretical risk of formaldehyde-related cancers among long-term e-cigarette users is three times the theoretical risk of formaldehyde-related cancers among long-term one-pack-per-day tobacco cigarette smokers. If the data are solid, it would be important to acknowledge that increased risk. At the same time, you should offer some perspective by pointing out the dramatic decrease in the theoretical risk of many other forms of cancer if a tobacco smoker were to switch to vaping. Without that credibility (and integrity), such an attempt at putting the results into a larger perspective would likely fall on deaf ears.

- **Consider providing media training resources for researchers, both inside and outside industry.** Surveys of scientists, and my own experience providing media training to academics, suggest that many researchers want to explain their research to the public but face barriers such as finding journalists unpredictable (25) and not understanding their needs and motives; fears about how they will look to their peers; and lack of structured practice in explaining their work in simple, accessible terms with helpful analogies (26). A website available to all scientists is one possibility. An
open web-based resource is immune to concerns or potential discomfort about industry support.

- **Go beyond promoting comments from industry sources.** This goes against common wisdom. Industry groups routinely promote their executives or spokespeople to comment on scientific research. However, as shown above, journalists are naturally wary of industry sources (27), and particularly those linked with the tobacco industry.

One alternative is building a database of highly qualified university-based and independent (non-industry) researchers who are approaching vaping, nicotine and related issues such as youth risk behaviors from the perspective of harm reduction, and who can be referred to journalists to help them interpret research accurately in their areas of expertise. Researchers would of course need to give permission for such referrals, with the shared goal of broadening journalists’ access to experts who can improve the public’s understanding of science.

- **Develop a list of key journalists** who are likely to cover health and science stories in a variety of media, and build relationships with them. Previous research (28) and the examples above clearly show the difference in the quality of reporting of complex scientific information between those reporters who covered health and science as a beat (and likely had academic training in science or medicine) and those who were general assignment reporters who were asked by their editors to cover a vaping-related science research story. Do not neglect online-only journalists, who may have considerable expertise in health and science (29).

Because of the significant turnover among media outlets, this list will have to be continually updated. Build relationships with these journalists ahead of time so that they know you can refer them to independent and useful resources (interview subjects) when they are covering a vaping-related story. Let the journalists know that the researchers you’ll refer them to are not connected to or receiving funds from the e-cigarette industry, but simply want to promote the accurate coverage of this complex area of science.

Also remember that there are multiple potential “touch points” (both times and people) for reaching out to news media to increase the odds of accurate interpretations of scientific studies.

- **Develop simple online materials that can help journalists** ask the types of questions about such studies that scientists would ask in order to assess the quality of the data and of the conclusions. There is a need and demand for such training (30), but journalists frequently lack time and money to attend formal training courses.

In my earlier work at the Harvard Medical School/Massachusetts General Hospital Center for Mental Health and Media, and under a grant from the National Institutes of Health, we developed a training program in
conjunction with the National Press Foundation. It was aimed at helping
general assignment reporters in all media improve their critical thinking
skills when screening press releases and reporting science-related stories. It
was called “Spot the Crap!” (31) That experience taught us that reporters,
producers and editors strongly preferred such professional education
to be online and available when they need it rather than live classroom
instruction.
Multimedia web content might cover topics such as how to communicate
about relative risk, a quick-and-dirty guide to statistics, and how to “spot
the crap” in misleading press releases about research findings. Materials
could include interviews with reporters specializing in health and science
who share their reporting tips and give examples of successes (e.g., seeing
the connection between a technical research paper and a community issue)
and failures (e.g., not being appropriately skeptical of a study’s results).
- **Build an online repository of resources** on nicotine, reduced-harm
products, tobacco smoking cessation and health that can be accessed
by reporters when they need it. These should be from independent
(third-party) sources such as research publications and white papers by
independent researchers. Thus, for example, when it would be helpful
for a journalist to have an authoritative source cite the theoretical (and
eventually, clinical) decline in cancer risk when a tobacco smoker switches
to vaping, you can quickly provide it.
Finally, to help non-specialist reporters understand the issues, consider
supporting the creation of plain-language summaries of tobacco-related
technical reports that are issued to members of the media. For example,
media coverage of the 2016 Cochrane Collaboration report, “Electronic
Cigarettes for Smoking Cessation,” (32) drew heavily on and was greatly
improved by the plain-language summary included in their otherwise
daunting report.

References

1. National Science Board, National Science Foundation. *Science and
gov/statistics/2016/nsb20161/#/report/chapter-7/interest-information-sources-and-involvement
2. Yates K., Friedman K, Slater MD, Berman M, Paskett ED, Ferketich AK.
A content analysis of electronic cigarette portrayal in newspapers. *Tobacco
regulation? A content analysis of UK newspapers. *Addiction*, 2016 July,
111(7), 1267-1274.


15. http://www.reuters.com/article/usa-health-ecigarettes-idUSL1N0UZ24620150121


VAPERS AND THE VAPING INDUSTRY ARE THE PRIMARY AGENTS OF TOBACCO HARM REDUCTION IN THE UNITED STATES

Christopher Russell
Centre for Substance Use Research
Glasgow, UK

Abstract
The most commonly used method of quitting smoking in the United States, substituting e-cigarettes for cigarettes, was not conceived by, is not recommended by, and was, until very recently, not controlled by the U.S. Food and Drug Administration (FDA). The increasing popularity of a method of quitting smoking that is not recognised by FDA as an effective smoking cessation method highlights a divergence between how tobacco harm reduction has been conceptualised within the medical science and health policy communities and how tobacco harm reduction is being exercised in the real world by more and more smokers.

In this article, I argue that, for the past decade, tobacco harm reduction in the real world has been driven by manufacturers, vendors, consumers and advocates of vapour products. Testimony reveals that smokers rarely initiate vaping without first researching the products or talking to a vaper or a vape shop sales assistant about why they vape, how the vaping experience compares to smoking, or how their life and health has changed since becoming a former-smoking vaper. The knowledge, practical advice and encouragement that have been transferred to smokers through millions of such interactions have likely rationalised and motivated millions of attempts to substitute e-cigarettes for conventional cigarettes that may not have occurred in the absence of these peer interactions.

The increasing preference of U.S. smokers to use nicotine-containing products as a method of quitting smoking suggests progress towards a smoke-free society may be further accelerated by a nicotine regulatory system that encourages an expansion and diversification of the market in new tobacco and nicotine products that appeal to and reduce harm to smokers, and maximises the user community’s opportunities to interact with smokers.

Introduction
Tobacco smoking continues to kill more people, cause more disease, and contribute more to social inequalities in high-income countries than any other preventable factor (1). In the United States, 480,000 lives are lost annually to smoking-related diseases, with more than 20 times this number of people suffering with a smoking-related disease (2,3). Smokers lose around three months of life, on average, for every year of smoking after age 35, equating to around 10 years of life lost by
lifelong smokers compared to non-smokers (4,5). Quitting tobacco smoking at the soonest opportunity is therefore the best action a person can take to improve his or her health in the medium to long-term (6), but quitting smoking is notoriously difficult. Given that most of the 8 million smoking-related deaths that are projected to occur globally by 2030 will be among people who are currently smoking, not those who have yet to start (7), developing new and evermore effective ways of helping more people to quit smoking as soon as possible is a public health imperative.

Tobacco harm reduction aims to prevent or reduce harm by promoting substitution of combustible tobacco with less hazardous non-combustible sources of nicotine to smokers who do not quit smoking in response to conventional tobacco control measures (1). E-cigarettes – hand-held devices that use battery power to heat a solution of propylene glycol, glycerol and often flavorings and nicotine, to deliver nicotine to the user via an inhaled aerosol – have rapidly grown in popularity among adults as an alternative to smoking conventional cigarettes. Though data on the safety of long-term use of nicotine by inhalation will not be available until e-cigarettes have been in widespread use for several decades, two national health authorities in the United Kingdom – Public Health England (8) and the Royal College of Physicians (1) – estimate the long-term health risks of inhaling the known constituents of e-cigarette vapor to be unlikely to exceed 5% of the health risks of smoking tobacco. These authorities also agree that e-cigarettes may be amongst the most effective methods for helping people stop or reduce smoking (9,10,11,12). While continuing to recognize complete cessation of all tobacco and nicotine use as the best course of action a smoker can take to improve his or her health, the U.K. Department of Health has therefore pledged to support policies that maximize the availability of less harmful forms of nicotine delivery, such as e-cigarettes, to adult smokers, and support smokers to switch to less harmful nicotine products at the soonest opportunity (13). Given that substitution of e-cigarettes for tobacco smoking has the potential to prevent almost all the harm caused by smoking, identifying initiatives, settings and people that may increase smokers’ capability, opportunity and motivation to use e-cigarettes in place of tobacco cigarettes is vital.

Increasing use of e-cigarettes is associated with an increased rate of smoking cessation
E-cigarettes are now the most popular assisted method of quitting smoking in the United States, used in 35% of most recent quit attempts (14). Moreover, a recent analysis of U.S. population survey data for 2014-2015 (15) concluded that e-cigarette users were more likely than non-users to attempt to quit smoking (65% vs. 40.1%) and more likely to succeed in quitting (8.2% v. 4.8%). Data also revealed a statistically significant association between an increase in e-cigarette use between 2010 and 2015 and an increase in smoking cessation at the population level.
Specifically, the population rate of smoking cessation in the United States was 1.1% higher in 2015 – when the population rate of current e-cigarette use was 28.0% – than in 2010 – when the population rate of current e-cigarette use was around 1% – and higher than all previous survey years – when the population rate of current e-cigarette use was non-existent. This 1.1% increase in the smoking cessation rate between 2010 (4.5%) and 2015 (5.6%) is significant for several reasons. First, 1.1% represents approximately 350,000 additional ex-smokers in 2014-2015. Second, such an effect on smoking cessation at the population level has been predicted, but never observed, for nicotine replacement therapies or varenicline (Chantix). Third, 1.1% represents the first significant increase in the smoking cessation rate at the population level in the U.S. for the past 25 years. The study authors caution, however, against attributing the full 1.1% increase to e-cigarettes alone, and instead suggest it is more probable that e-cigarettes interacted synergistically with media campaigns, tobacco tax increases and other state and local tobacco control measures to yield this effect. For example, mass media campaigns may have increased smokers’ motivation to quit, while e-cigarettes may have increased the probability of a smoker making an attempt to quit and succeeding.

The apparent positive effect of e-cigarettes on population smoking cessation rate in the U.S. is consistent with that revealed by a 2016 time-series analysis of population trends in e-cigarette use and smoking in England (16). E-cigarette use as part of a quit attempt rose from negligible use in the last quarter of 2006 to 35.0% in the first quarter of 2015. Over the same period, there was an overall increase in the success rate of those who reported a quit attempt (from 10.6% in the last quarter of 2006 to 18.6% in the first quarter of 2015). In all, e-cigarettes were estimated to have contributed approximately 18,000 additional long-term ex-smokers in England in 2015. If the link between change in e-cigarette use and smoking cessation rate was causal, then every 10% increase in use of an e-cigarette as part of a quit attempt would result in a 0.58% increase in successful quit attempts, other things being equal.

Overall, the results of these two studies, based on large representative samples of e-cigarette users in the U.S. and U.K., suggest a similar positive effect on smoking cessation at the population level may be seen in other jurisdictions if a large proportion of smokers can be encouraged and assisted to use e-cigarettes on a daily basis to aid attempts to quit smoking. That is, encouraging and assisting as many smokers as possible to switch to e-cigarette use at the soonest opportunity appears to offer governments the best opportunity in a generation to significantly accelerate the rate at which people quit smoking for good. To the extent that the U.S. Food and Drug Administration (FDA) may ultimately follow the U.K Department of Health in concluding that e-cigarettes are likely to be substantially less harmful to the user and bystanders than conventional cigarettes, and that promoting substitution of e-cigarettes for conventional cigarettes among existing...
smokers would likely yield a substantial net public health benefit, the critical question for U.S. tobacco control policy then is: who and what has the greatest potential to increase the proportion of U.S. adult smokers who use e-cigarettes as an aid to quitting smoking? To answer this, we must first be clear about who and what has been primarily responsible for growth in the rate of current use of e-cigarettes among U.S. adult current smokers from 1% in 2010 to 30.1% in 2015.

Explaining the rise of vaping in the United States
In this article, I argue that, for the past decade, tobacco harm reduction in the United States has been driven by manufacturers, vendors, consumers and advocates of vapor products. The increasing use of e-cigarettes as aids to quitting smoking since 2010, and the associated increase in smoking cessation at the population level, I suggest, is almost entirely attributable to the availability of increasingly satisfying vapor products, and to the education, advice and support that has been transferred from vapers to smokers through millions of interactions in vape shops, on vaping-dedicated websites, in online discussion groups, at workplaces and at social events. Lastly, I argue that encouraging smokers to engage with and learn from vapers in places that are dedicated to vaping-related discussion, education and advice – in particular, vaping-dedicated websites and vape shops – represents the best opportunity to accelerate the population rate of switching from smoking to vaping in jurisdictions where vapor products are accessible, affordable and attractive to adult smokers.

U.S. public health efforts to discourage e-cigarette use by smokers
Federal, state and local U.S. public health authorities, in general, canclaim no credit for the increasing use of e-cigarettes by adult smokers or, by implication, for the significant increase in smoking cessation at the population level that is attributable to an increased prevalence and frequency of use of e-cigarettes to aid smoking quit attempts. Since the emergence of e-cigarettes in the U.S. market, the FDA, Centers for Disease Control and Prevention (CDC), and a long list of medical institutions and health charities (e.g. American Lung Association, American Heart Association, Campaign for Tobacco-Free Kids) have explicitly discouraged smokers from using e-cigarettes either as a substitute for conventional cigarettes, an alternative to using nicotine replacement products and medications that are FDA-approved for smoking cessation, or as an alternative to quitting all tobacco and nicotine use completely. The messages consistently communicated to smokers, implicitly and explicitly, by these authorities have been that the long-term risks of using e-cigarettes are not known, e-cigarette vapor contains many of the same chemicals found in cigarette smoke, the relative harmfulness of e-cigarettes and cigarettes has not been established, and the effectiveness of e-cigarettes for helping people to stop smoking has not been proven. It is feasible that repeated exposure to such claims have maintained smoking by individuals who would have considered switching to e-cigarettes, any may be one of several factors that
explain why the proportion of U.S. adult current smokers and former smokers who incorrectly believe that using an e-cigarette is equally or more harmful than smoking a conventional tobacco cigarette has increased annually between 2012 and 2106 (17). Given that smokers’ decisions to switch to e-cigarettes are known to be strongly influenced by a belief that e-cigarettes are likely to be less harmful than conventional cigarettes, this increasingly common misperception of the harmfulness of e-cigarettes relative to conventional cigarettes may in part explain why around six in ten U.S. adult current smokers have never used an e-cigarette (18).

What has occurred since 2010, therefore, is that millions of U.S. adults have made a decision to quit smoking by using vapor products that are not recognized by any local, state or federal health authority as effective for smoking cessation. The increasing popularity of a method of quitting smoking that, to date, has not been recognized by any health authority in the United States as an effective or potentially effective smoking cessation method highlights a divergence between how tobacco harm reduction has been conceptualized within the medical science and health policy communities and how tobacco harm reduction is being exercised in the real world by more and more smokers.

**Vapers and the Vaping Industry Are the Primary Agents of Tobacco Harm Reduction**

With the exception of the publication of scientific articles by a small number of tobacco harm reduction scientists that received very limited coverage by news media, the vape-using community and the vape-manufacturing industry have provided the only sources of encouragement for U.S. adult smokers to switch to e-cigarettes in the past ten years. The rapid increase in use of e-cigarettes in the United States is best described as a consumer-led revolution in how nicotine is consumed in society. This assertion is true in two senses: first, vapor products emerged as a widespread alternative to cigarettes in response to smokers’ want for inhalational products that decoupled low-risk nicotine from high-risk smoke, and second, many individuals became not merely consumers of vapor products, but enthusiasts and advocate who took it upon themselves to encourage and assist more smokers to try vaping.

The modern history of vaping began in the early 2000s when a Chinese pharmacist, Hon Lik, motivated by the death of his father to lung cancer caused by smoking, conceived and invented the electronic cigarette as a means to accelerate the decline in cigarette smoking, and more immediately, by aerosolizing nicotine for inhalation via vapor rather than smoke, to reduce and prevent harm to tobacco smokers. Lik believed that if e-cigarettes could be manufactured to deliver nicotine with a speed and efficiency that rivalled nicotine delivery via tobacco smoke, and these devices were made available, attractive and affordable to all smokers in the population, many smokers would choose to use an e-cigarette in place of...
conventional cigarettes. And so, with the help of his employer, Ruyan Group, now Dragonite International, Lik brought the e-cigarette first to Europe, and then in 2007, to the United States. Early e-cigarette models quickly became popular with smokers who wanted to consume nicotine in a way that replicated the experiential satisfaction, sensorial pleasures, behavioral rituals, and emotional functions of smoking a cigarette, that, critically, wouldn’t kill them. This new technology gave smokers hope that further innovations of vapor technology could eventually yield a portfolio of vaping products that deliver ‘all of the pleasure of smoking with none of the death’. Since Lik’s early e-cigarette, manufacturers have aspired to innovate nicotine vaporizing technologies ever closer to meeting this pleasure-health ideal.

As vape manufacturers have innovated, expanded and diversified a portfolio of vaping products to better meet the wants and needs of more smokers, and as users have reaped subjective health, social and financial benefits from the use of these products, online and offline communities comprising millions of former-smoking vaping enthusiasts from around the world have formed. Beyond discussion of new devices and flavors among advanced vapers, these communities are typically characterized by a selfless desire, even a perceived responsibility, to educate, advise and support smokers and new vapers to get started with vaping and to get the most out of vaping, such that giving up smoking becomes experientially easier as vaping continues.

The remainder of this article will make the case for why vapers, the actual users of vapor products, are best placed to increase e-cigarette use by smokers, and suggest where vapers may most effectively encourage, educate, and assist smokers to become vapers.

Encourage smokers to engage with vapers online
Testimony reveals that smokers rarely initiate vaping without first researching the products or talking to a vaper or a vape shop sales assistant about why they vape, how the vaping experience compares to smoking, or how their life and health has changed since becoming a former-smoking vaper. The learning, practical advice and encouragement that has been transferred to smokers through millions of such interactions with vaping peers have likely been critically important in rationalising millions of smokers’ decisions to substitute e-cigarettes for conventional cigarettes, and motivating quit attempts that would not have occurred without these peer interactions. Even as interest in vaping increases among medical practitioners and public health scientists, the vape-using community will continue to be uniquely, and perhaps, best qualified to advise and educate smokers, researchers and regulators about the true nature and character of vaping.

Given experienced vapers’ apparent eagerness to share with smokers the types of advice and information that answer smokers’ most frequently asked questions,
the potential of former-smoking experienced vapers to assist smokers to switch to e-cigarettes may be substantial. The question then is, in which settings, and through which media, would smokers be most interested to interact with vaping peers about vaping, and vapers be most accessible to smokers? A first reaction among public health researchers may be to suggest that primary health services and smoking cessation services are the optimal settings in which vapers can intervene to help smokers switch. Though vapers may have significant potential to boost quit rates within smoking cessation services by helping smokers in ways that smoking cessation advisors cannot – and longitudinal studies of this question are warranted – the suggestion that vapers’ potential to convert smokers would be best realized within formal health service settings fails to recognize that millions of smokers have become vapers over the past decade without ever interacting with the public health community on vaping, or even in spite of their doctors’ warnings against the use of e-cigarettes.

Instead, the rapid growth in the number of ex-smokers in the U.S. who now vape has occurred through millions of interactions between smokers and the vape community – manufacturers, vendors and consumers of vapor products. These peer-to-peer interactions take place primarily where vapor products are sold (e.g. vape shops) and online at websites dedicated to discussion and learning about vaping (e.g. discussion fora, blogs, instructional articles, tutorial videos). The authenticity, specificity and accessibility of the education about vaping available through interactions with vapers in vape shops and vaping-dedicated websites are likely among the main reasons why smokers and new vapers may tend to prefer to learn about vaping from the vape community than from the public health community. And in the past decade, thousands of free online resources have been created by experienced vapers to provide education, practical advice and motivational support to smokers who are curious about vaping or contemplating a switch to vaping. The remainder of this article will describe how three vaping-dedicated websites have dwarfed every public health resource about vaping in terms of their reach, attractiveness, availability, education and advice on getting started with vaping and switching completely from smoking to vaping.

**E-Cigarette Forum**

E-Cigarette Forum (ECF; www.e-cigarette-forum.com) has become the largest e-cigarette specific social network since its founding in 2007, with now more than 254,000 members, of whom approximately 10% are active at a given time, and with approximately 1.9 million unique visitors per month. Together, these members and guests have posted more than 17.7 million messages to more than 632,000 separate discussions about vaping, most of which are written by advanced vapers for the benefit of smokers and new vapers. Smokers may wish to start by reading messages posted in the larger discussion threads (e.g. ‘General Vaping Discussion’ or ‘General E-Liquid Discussion’) or in discussion threads more relevant to their
specific questions and concerns (e.g. ‘Vaping Success Stories’, ‘Health, Safety and Vaping’, ‘Requests for Opinions/Reviews’, or ‘Ask the Veterans’). At any time of the day, without leaving their house or making an appointment, smokers can learn how to get started in using thousands of specific brands and models of vaping hardware and e-liquids, and initiate conversations with experienced actual users of specific devices, kits and liquids. A true public health benefit of the discussion threads of ECF is that no smoker in the world need every try a vapor product without first being able to talk to tens if not hundreds and thousands of people who have used that product, and are willing to give their review of the product. Indeed, one of the main points of advice given by members of ECF to new vapers is to ‘ask before you buy’. Such preliminary advice can in many cases save a smoker from purchasing a poor-quality product or a product that just won’t, for example, give him/her the flavor experience or volume and vapor he/she is looking for.

**Vaping360**

Vaping360 (www.vaping360.com) was established in August 2015 as a platform for smokers, new vapers, researchers, nicotine regulators and other stakeholders to learn from vapers about the best (and worst) ways to transition from regular smoking to regular vaping. The site has since evolved into a more holistic source of education and assistance for smokers trying to switch. Vaping360 now features regularly posted plain English summaries of new published scientific research on the health effects of vaping; plain English summaries of legislation and regulations that may affect the availability, affordability and attractiveness of vapor products; plain English reviews of newly released vaping devices and flavors; news of vaping advocacy events taking place in various cities and states; and a synthesis of live deals and discounts on vapor products from across the internet.

A main feature of Vaping360 is called ‘Best Vapes’, which, as the title suggests, rates the ‘best’ three products in a range of vapor product categories, from the ‘Best Starter Kits’ for smokers to switch to vaping and the ‘best e-juice brands to try on a budget’, to slightly more advance products, such as ‘Best Vape Pens’ and ‘Best Clearomizers’, to yet more advanced vapor products, such as ‘Best Rebuildable Tank Atomizers’ and ‘Best Sub-Ohm Tanks’. The status of the three products in each category as the ‘best’ is based on reviewers’ ratings of each product on a number of criteria, such as flavor, air flow, clouds, battery life and value for money. Such recommendations can help smokers, new vapers, and advanced vapers ‘see the wood for the trees’ by more quickly narrowing down choices to products that are more likely to be ‘right’ for them.

Vaping360 also features a ‘How to’ section for smokers who are contemplating switching to vaping and new vapers, called ‘Vaping 101’. This section contains short articles, written by advanced vapers, giving practical advice and answers to some common questions about how to get started with vaping. Recent articles include
‘10 simple steps to stop your tank leaking’, ‘PG (propylene glycol) vs VG (vegetable glycerin)’, ‘Rebuildable tanks explained’, and ‘Vaping and Inhaling: Everything you need to know’, among many others. These articles are contributed by more than 20 freelance writers from around the world, almost all of whom are advanced vapers who used to smoke.

Like ECF, what makes Vaping360 a resource capable of educating and encouraging smokers at the population level to switch to vaping is its huge global popularity with vapers and potential for attracting smokers in the U.S. and around the world – the site has been visited by approximately 15.5 million unique individuals from around the world since its launch in 2015, and is visited by approximately 1.1 million unique individuals every month, of whom approximately 500,000 come from the United States.

**Vaping.com**

Vaping.com (VDC), a sister site to ECF, is best known to vapers as an online ‘supermarket’ for purchasing popular brands of vaping kits, devices, liquids, tanks and parts. But VDC has also become known as the home of an excellent series of ‘Vaping Guides’ targeted at smokers and new vapers. These ‘Guides’ are regularly posted short articles, written by experienced vapers in simple non-technical language, that give practical step-by-step advice, recommendations, and answers to some of the most fundamental questions asked by new vapers, and to some questions that new vapers may not think to ask. Recent articles include ‘Mouth to Lung vs. Direct to Lung. All about puff; which is for you?’ – in which the author explains the differences between two common puffing styles, and the benefits and sensations associated with each – ‘How to Clean a Vape Device: The Newbie Maintenance Guide’ – which gives detailed instructions on how to simple rinse, deep clean and re-assemble the parts of a vape tank – ‘The Biggest Mistake New Vapers Make’ – which, according to the author, is failing to carry a backup device or failing to carry additional supplies to service one’s main device – and ‘Start Vaping in 5 Easy Steps, the Beginners Guide’. For those interested, the author of the latter article guides smokers on how to pick the experience they are looking for, how to pick a device that will best meet their wants and needs, how to pick flavors and nicotine strengths they will enjoy vaping, how to get the right parts to maintain their chosen device (compatible replacement coils and batteries), and to read the instructions that come with their chosen products to ensure they get the most satisfaction out of using the products.

Reading these four short but incisive articles on VDC would take a smoker but 20 minutes, after which he/she may be expected to be significantly more knowledgeable and confident to choose, use, maintain and enjoy a vaping device. Encouraging smokers to read these Guides, and more widely interact with and seek advice from experienced vapers at these and similar websites, could have
significant potential to increase smokers’ awareness of the variety of vaping products and features, increase smokers’ motivation to try using e-cigarettes in place of cigarettes, and ultimately, help more smokers to find the combination of vaping products that ‘work for them’ as an alternative to smoking.

**Recommended reading for healthcare professionals who interact with smokers**

The discussion threads and educational guides to vaping posted at ECF, Vaping360 and Vaping.com are not only informative to smokers and new vapers; they would make excellent recommended reading for smoking cessation advisors and primary care health professionals who regularly interact with smokers but do not feel confident or competent to discuss vaping products with them. Such online information can educate health professionals about, among others, vaping vernacular, the evolution of vaping products, and changing trends in their clients’ patterns and styles of vaping. The staff of smoking cessation services and other primary care services may also seek to learn from, and even employ in a voluntary or paid capacity, local former-smoking e-cigarette users and local vendors of vaping products. Participants qualitative responses in this study suggest they may not only be keen to help smokers directly, but would also possibly welcome opportunities and invitations from smoking cessation and other health services to educate staff about vaping, even if in an informal, infrequent, unpaid capacity. At present, both consumers and vendors of vaping products remain resources largely unused by most stop smoking services (SSS) and other primary health services, which not only leaves staff without a valuable source of education, but may also reduce a smoker’s interest in engaging with the service. To dismiss or neglect the insights and experiences of these individuals could prove to be a significant missed opportunity for health services, academics and e-cigarette manufacturers to help more people quit smoking and avoid relapse. Longitudinal studies are warranted to examine the extent to which the receipt of support from vaping peer, whether brief or ongoing and whether delivered in person or online, can increase smokers’ odds for quitting smoking or cutting daily cigarette consumption, particularly among smokers who have tried and failed to quit numerous times with the use of approved NRTs and smoking cessation medications.

**Conclusions**

Substitution of low-risk nicotine products, like e-cigarettes, for cigarette smoking is now the most common method of quitting smoking in the United Kingdom and in the United States. Former-smoking vapers, working in vape shops, engaging online in discussion groups, and taking time to offer education, practical advice and tales of personal experience about vaping to friends and colleagues who smoke, have, through their promotion of e-cigarettes as an alternative to smoking cigarettes, appear to be the primary agents of the most successful movement to reduce smoking-related harm in the United States in a generation.
By sharing their stories of how they used an e-cigarette to quit smoking, what they experienced along the way, and how their lives have changed since they switched, former-smoking vapers are providing current smokers with a valuable source of encouragement, knowledge, advice, and motivation required to trial an e-cigarette and then transition fully from smoking to vaping. Indeed, it may not be unreasonable to suggest that connecting a former-smoking e-cigarette user with a smoker who is curious about using an e-cigarette for smoking cessation may turn one quitter into two (i.e. ‘quitters creating quitters’). Encouraging smokers and new vapers to interact with experienced e-cigarette users who have already quit smoking by switching to e-cigarettes in settings that appeal to them – whether in vape shops, vaping-dedicated websites or within smoking cessation services – may represent an opportunity to accelerate the current rate of switching from cigarette smoking to e-cigarette use.

There continues to be a pressing need for research that collects, summarizes and communicates the views and experiences of successful former-smokers to both current smokers and to those charged with regulating nicotine vapor products. Stories of how an individual switched from smoking to vaping can be hugely informative to smokers and nicotine regulators about the ways in which e-cigarettes have enabled people to quit smoking. If the innovation of increasingly effective and safer e-cigarette products is not stifled by regulations in a jurisdiction, and if smokers are encouraged and supported to use e-cigarettes as an alternative to smoking, educated about the relative health risks and benefits of switching to vaping versus continuing to smoke, and educated on how to properly use and maintain their device, then the individual and population health benefits of e-cigarettes have the potential to be unmatched by any other currently available smoking cessation product, method or policy. Connecting smokers to the insights and advice of former-smoking vapers may represent a significant portion of that potential.

References