# HB 360

<TARGET><BILL>HB 360</BILL><SUBJECT>HB 360</SUBJECT><COMM>HHSS28</COMM></TARGET>

# Representative Lindsey Holmes

**House Bill 360 Sponsor Statement**
**An Act prohibiting smoking in certain locations; and providing for an effective date.**

HB 360 seeks to protect Alaskans from the well-known health harms of secondhand smoke. This legislation would update existing Alaska state law to provide comprehensive protection from secondhand smoke for all Alaskans in indoor workplaces, businesses and public places. The proposed law would replace the current Alaska Smoking Law, which only prohibits smoking in limited settings such as healthcare facilities, schools, childcare, and public meeting rooms of government buildings, and otherwise provides smoking and non-smoking sections, which does nothing to protect the air quality of employees.

Under current Alaska Smoking Law, individual municipalities have the ability to create more restrictive smoking requirements however; unorganized areas do not have the ability to legislate health powers. This leaves about 70,000 Alaskans without protection from second hand smoke. HB 360 seeks to extend the protections found in Bethel, Anchorage, Juneau, Barrow, Dillingham, Haines, Skagway, Petersburg, Klawock, Nome, Unalaska, and Palmer to places like Fairbanks North-Star Borough, Mat-Su Borough, and Kenai Peninsula Borough as well as other unorganized areas.

This bill is based on current local laws in Anchorage, Juneau, and Palmer, which are well established and well regarded by citizens and businesses. This legislation takes the concept of those working laws, expands them statewide, so that all Alaskans are free from exposure to secondhand smoke in public spaces and workplaces. 400 Alaskan businesses and organizations, representing all regions of the state, have already signed on in support of a statewide smoke-free workplace law.

Please join me in supporting this important piece of legislation that will protect the right of all Alaskans to breathe clean air.

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Rep.Lindsey.Holmes@akleg.gov

# Representative Lindsey Holmes

## Summary of Changes

# CSHB 360 – Smoke-Free Work Places & Enclosed Public Places

- **Page 1, lines 1-2:** The drafter recommended a slight rewording of the title. "Prohibiting" on line 1 was replaced with "relating to a prohibition on".

- **Page 1, line 8 & Page 2, line 15:** Re-ordered section (a) by splitting the list of locations where smoking is prohibited between "enclosed areas at or within" particular places under subsection (1), versus "at or within" outside locations or within a specified distance of entrances under subsection (2). This change makes it more clear what is specifically prohibited by the proposed law.

- **Page 2, line 1:** Deleted the words "health care facility" from the list in subsection (a)(1)(D) because it is included specifically in (a)(1)(G) on page 2.

- **Page 2, lines 11-12:** Added a new subsection (H) that specifies that smoking is prohibited within a vehicle that is a place of employment unless the vehicle is operated exclusively by a single individual.

- **Page 3, line 1:** The words "or adults" were inserted after "children" to clarify that the exception in this subsection for private residences does not include a location where adult care is provided on a fee-for service basis.

- **Page 3, lines 13-17:** Subsections (b) & (c) were combined and rewritten to place the responsibility to post signage that smoking is prohibited on the person in charge of a particular building. The original wording placed this responsibility on the commissioner of health and social services for public buildings, without any mention of other buildings.

- **Page 3, lines 21-22:** Subsection (d) was rewritten to require the Department of Health and Social Services to provide signs required under this section if requested. This change was made in response to a request by a representative of small businesses in Alaska. Old subsection (d) was unnecessary because the word "vehicle" was added into the language in (a).

- **Page 3, Sec. 18.35.331:** Old subsection (f) was redundant and deleted. Can be found on page 3, lines 17-18 of Version "A".

# Representative Lindsey Holmes

## Sectional Summary

# CSHB 360: Smoke-Free Work Places & Enclosed Public Places

**Section 1** creates new sections of law within AS 18.35 describing where smoking is prohibited or regulated.

- **Sec. 18.35.301(a)(1)** prohibits smoking in enclosed areas within or at places of employment, public places, transportation facilities, schools, health care facilities, restaurants, bars, hotels, motels, child care locations, marine vessels operating as a shore-based fisheries business, and public meeting rooms.

- **Sec. 18.35.301(a)(2)** describes other areas where smoking is prohibited including outdoor arenas, stadiums or amphitheaters, areas at a public school or playgrounds, and within a certain distance of health care facilities, bars and other buildings.

- **Sec. 18.35.301(b)** lists three exceptions to the prohibitions in (a) of this section. Exceptions are provided for certain private clubs, most private residences unless used for adult or child care, or if located within a health care facility or within a hotel or motel, and marine vessels when the vessel is operating as a work place for commercial or sport charter fishing.

- **Sec. 18.35.331** describes the obligations of employers, owners and operators to post no smoking signs within places or vehicles where smoking is prohibited. Signs are also required at the entrance of buildings at which smoking is prohibited within a specific distance from the entrance to the building. Ashtrays or other smoking accessories cannot be provided at a building or place where smoking is prohibited. This section also requires the Department of Health & Social Services to furnish signs upon request.

- **Secs. 18.35.344(a) & (b)** requires the commissioner of health and social services to develop and maintain a procedure for processing reports of violations of the subsections above. This section allows the commissioner to either file a civil complaint in the district court to enforce the new law or issue a citation.

- **Secs. 18.35.344(c) through (e)** establishes fine amounts for violations of different sections of the law. Under subsection (c), a person who smokes where smoking is prohibited will be subject to a fine of $100. Under subsection (d), a

person who fails to comply the duties under Sec. 18.35.331 is subject to a fine of $100 for the first failure to comply, $200 for a second failure that occurs within 24 months of the first violation, and $500 for the third and each consecutive failure to comply within 24 months of the second violations. A person who violates the nonretaliation provision in Sec. 18.35.357 is subject to a fine not to exceed $1,000.

- **Sec. 18.35.344(f)** allows the department to accept fine payments by mail.

- **Secs. 18.35.345(a) through (e)** allow a peace officer or an employee designated by the commissioner to issue citations for violations of the new law. Violations by a person who smokes where smoking is prohibited must occur in the presence of a peace officer, but this is not the case for any employee designated by the department to issue a citation. Fines for any violations alleged in a citation are subject to the same fine schedule described in Sec. 18.35.344.

- **Secs. 18.35.345(f) through (i)** allow courts to implement ticketing and bail procedures for violations.

- **Sec. 18.35.346** permits the commissioner or another affected party to bring a civil action to enjoin a violation of the law.

- **New Sec. 18.35.351** requires the commissioner of health and social services to administer and enforce the provisions of the new law and adopt regulations as needed. Authority is provided for the commissioner to delegate to another agency the authority to implement one or more provisions of the law.

- **Sec. 18.35.356** requires the commissioner to provide ongoing access to public education about the law, including an electronically published brochure explaining the new requirements for employers, property owners, property operators and the public.

- **Sec. 18.35.357** prohibits an employer to discharge, refuse to hire, or to retaliate against an employee or applicant for employment because the employee or applicant cooperates with or initiates enforcement of a requirement in the law.

- **Sec. 18.35.359** establishes a municipality may adopt and enforce local laws with additional prohibitions on smoking or additional duties for employers, owners, operators, and other persons related to enforcement of such provisions.

- **Sec. 18.35.366** is the definitions section. Definitions are provided for business, commissioner, department, e-cigarette, employee, employer, enclosed area, health care facility, place of employment, private club, public place, and smoking.

**Section 2** repeals the state's existing statutes (AS 18.35.300, 18.35.305, 18.35.310, 18.35.320, 18.35.330, 18.35.340, 18.35.341-343, 18.35.350, 18.35.355, and 18.35.365) that regulate smoking in enclosed and public places.

**Section 3** is uncodified law and clarifies that the new provisions of this bill apply to violations or failures to comply that occur on or after the effective date of Section 1 of the bill.

**Section 4** is uncodified law and permits the Department of Health and Social Services to adopt regulations to implement Section 1 of the bill. Any regulations cannot take effect before the effective date of Section 1 of the bill.

**Sections 5 & 6** set effective dates for different sections. Section 4 takes effect immediately. The rest of the bill will be effective on October 1, 2014.

- **Page 6, line 29:** The phrase "or a political subdivision of the state" was deleted from proposed by the drafter.

- **Page 7, lines 9-12:** Amended the definition of "e-cigarette" to including a broader range of e-cigarette products that issue "a vapor for inhalation" versus "a nicotine vapor for inhalation". There are some e-cigarettes marketed with toxins present that do not contai

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Strasbaugh
3/21/14

**CS FOR HOUSE BILL NO. 360( )**

IN THE LEGISLATURE OF THE STATE OF ALASKA

TWENTY-EIGHTH LEGISLATURE - SECOND SESSION

**BY**

**Offered:**
**Referred:**

**Sponsor(s): REPRESENTATIVES HOLMES, Olson, Millett, Edgmon, Higgins, Peggy Wilson, Herron, Muñoz**

**A BILL**

**FOR AN ACT ENTITLED**

**"An Act relating to a prohibition on smoking in certain locations; and providing for an effective date."**

**BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:**

*** Section 1.** AS 18.35 is amended by adding new sections to read:

**Article 4. Regulation of Smoking in Public.**

**Sec. 18.35.301. Prohibition of smoking.** (a) Except as provided in (b) of this section, smoking is prohibited in the following places:

(1) enclosed areas at or within

(A) a sports arena, public educational facility, private educational facility, shopping mall, or other enclosed public place;

(B) a bus, taxicab, ferry, or other public transportation vehicle;

(C) a public transit depot, bus shelter, airport, or other public transportation facility;

(D) an office building, common area, office, employee lounge,

hotel, motel, restaurant, bar, retail store, or other enclosed area in a place of employment;

(E) a room, chamber, place of meeting, or other enclosed place of government or public assembly located on property that is owned or operated by the state, a municipality, or a regional educational attendance area, or by a board, council, commission, committee, authority, or other agency of the state, a municipality, or regional educational attendance area;

(F) a building or residence that is used to provide paid child care, whether or not children are present in the building or residence;

(G) a health care facility;

(H) a vehicle that is a place of employment unless the vehicle is used exclusively by one employee;

(I) a marine vessel operating as a shore-based fisheries business under AS 43.75;

(2) at or within

(A) an area located at a public or private school or a state or municipal park that is primarily designated as a place for children to play;

(B) a seating area for an outdoor arena, stadium, or amphitheater;

(C) 50 feet of an entrance to a health care facility;

(D) 10 feet of an entrance to a bar or restaurant licensed or permitted to serve alcoholic beverages; or

(E) 20 feet of an entrance, open window, or heating or ventilation system air intake vent at a place of employment or other enclosed area at a place where smoking is prohibited under this section.

(b) Unless the owner or operator prohibits it, smoking is allowed in the following places:

(1) a private club that is not licensed or permitted to serve alcoholic beverages and is not a place of employment, unless the private club is hosting an event that is open to the public;

(2) a private residence, unless it is a residence at which the care of

children or adults is provided on a fee-for-service basis, a residence in a health care facility, or a residence located within a hotel or motel;

(3) a marine vessel, when the vessel is engaged in commercial fishing or sport charter fishing.

(c) Nothing in this section authorizes smoking prohibited under another law.

**Sec. 18.35.331. Obligations of employers, owners, and operators.** (a) A person who is in charge of a place or vehicle where smoking is prohibited under AS 18.35.301 shall conspicuously display in the place or vehicle a sign that reads "Smoking Prohibited by Law--Maximum Fine $100" and includes the international symbol for no smoking or, in the alternative, the words "No Puffin" with a pictorial representation of a Horned Puffin or Tufted Puffin holding a burning cigarette enclosed in a red circle crossed with a red bar.

(b) A person in charge of a building at which smoking is prohibited within a specific distance from the entrance of the building under AS 18.35.301 shall conspicuously display a sign that reads "Smoking within (number of feet) Feet of Entrance Prohibited by Law--Maximum Fine $100" outside each entrance to the building.

(c) The owner, operator, manager, or other person who manages a building or other place where smoking is prohibited under AS 18.35.301 may not provide ashtrays or other smoking accessories for use in that building or place.

(d) The department shall furnish signs required under this section to a person who requests them with the intention of displaying them.

**Sec. 18.35.344. Violations and civil penalties.** (a) The commissioner shall develop and maintain a procedure for processing reports of violations of AS 18.35.301, 18.35.331, and 18.35.357.

(b) If, after investigating a report made under this section, the commissioner determines that a violation has occurred, the commissioner may

(1) file a civil complaint in the district court to enforce the provisions of AS 18.35.301, 18.35.331, and 18.35.357; or

(2) issue a citation under AS 18.35.345(b).

(c) A person who violates AS 18.35.301 and against whom the commissioner

has filed a civil complaint under this section is punishable by a civil penalty of not more than $100.

(d) A person who fails to comply with a duty imposed on that person by AS 18.35.331 and against whom the commissioner has filed a civil complaint under this section is punishable by a civil penalty not to exceed

(1) $100 for a first failure to comply;

(2) $200 for a second failure to comply that occurs within 24 months after the date the person was fined for a first failure to comply;

(3) $500 for each failure to comply that occurs within 24 months after the date the person was fined for a second failure to comply.

(e) A person who violates AS 18.35.357 and against whom the commissioner has filed a civil complaint under this section is punishable by a civil penalty not to exceed $1,000.

(f) The department may provide for the payment of a civil penalty under this section by mail.

**Sec. 18.35.345. Citations; fines.** (a) A peace officer may issue a citation for a violation of AS 18.35.301 committed in the officer's presence or for a violation of AS 18.35.331 or 18.35.357. The provisions of AS 12.25.175 - 12.25.230 apply to the issuance of a citation under this subsection.

(b) An employee of the department designated by the commissioner to enforce the provisions of AS 18.35.301, 18.35.331, or 18.35.357 may issue a citation for a violation of AS 18.35.301, 18.35.331, or 18.35.357 regardless of whether the violation was committed in the employee's presence. A citation issued under this subsection shall be in the same form and shall be processed in the same manner as a citation issued by a peace officer under (a) of this section. An employee of the department may not arrest a person for a violation of AS 18.35.301, 18.35.331, or 18.35.357.

(c) A person who violates AS 18.35.301 as alleged in a citation under (a) or (b) of this section is guilty of a violation, as defined in AS 11.81.900, and punishable by a fine not to exceed $100 for each violation.

(d) A person who fails to comply with a duty imposed on that person by AS 18.35.331 as alleged in a citation under (a) or (b) of this section is guilty of a

violation as defined in AS 11.81.900(b) and punishable by a fine not to exceed

(1) $100 for a first failure to comply;

(2) $200 for a second failure to comply that occurs within 24 months after the date the person was fined under this section for a first failure to comply;

(3) $500 for each failure to comply that occurs within 24 months after the date the person was fined under this section for a second failure to comply.

(e) A person who violates AS 18.35.357 as alleged in a citation under (a) or (b) of this section is guilty of a violation, as defined in AS 11.81.900, and punishable by a fine not to exceed $1,000 for each violation.

(f) The supreme court shall establish a schedule of bail amounts for violations of AS 18.35.301, 18.35.331, and 18.35.357, but in no event may the bail amount exceed the maximum fine that may be imposed for the violation under (c) - (e) of this section. The bail amount for a violation must appear on the citation.

(g) If a person cited for a violation under this section does not contest the citation, the person may, on or before the 30th day after the date of the citation, mail or personally deliver to the clerk of the court in which the citation is filed

(1) the amount of bail indicated on the citation for that violation; and

(2) a copy of the citation indicating that the right to an appearance is waived, a plea of no contest is entered, and the bail is forfeited.

(h) When bail has been forfeited under (g) of this section, a judgment of conviction shall be entered. Forfeiture of bail is a complete satisfaction for the violation. The clerk of the court accepting the bail shall provide the violator with a receipt stating that fact if requested.

(i) A person cited under this section is guilty of failure to obey a citation under AS 12.25.230 if the person fails to pay the bail amount established under (f) of this section or fails to appear in court as required.

**Sec. 18.35.346. Injunctions.** The commissioner or another affected party may bring a civil action in the superior court to enjoin a violation of AS 18.35.301, 18.35.331, or 18.35.357.

**Sec. 18.35.351. Powers and duties of the commissioner.** (a) The commissioner shall

(1) administer and enforce the requirements of AS 18.35.301 - 18.35.366;

(2) adopt regulations under AS 44.62 (Administrative Procedure Act) necessary to carry out the duties under this section.

(b) In addition to other powers granted the commissioner under AS 18.35.301 - 18.35.366, the commissioner may delegate to another agency the authority to implement and enforce one or more provisions of AS 18.35.301 - 18.35.366.

(c) Nothing in this section limits the authority of a peace officer to enforce law.

**Sec. 18.35.356. Public education.** (a) The commissioner shall ensure employers, property owners, property operators, and other members of the public are provided ongoing access to

(1) a program of education regarding the requirements in AS 18.35.301 - 18.35.366;

(2) an electronically published printable brochure that summarizes the requirements in AS 18.35.301 - 18.35.366.

(b) The program of education under (a) of this section may be provided in combination with the comprehensive smoking education, tobacco use prevention, and tobacco control program established in AS 44.29.020(a)(14).

**Sec. 18.35.357. Nonretaliation.** (a) An employer may not discharge, refuse to hire, or in any other manner retaliate against an employee or applicant for employment because the employee or applicant cooperates with or initiates enforcement of a requirement in AS 18.35.301 - 18.35.366.

(b) The owner or operator of a vehicle or other place that is subject to a requirement in AS 18.35.301 - 18.35.366 may not retaliate against a customer or other member of the public for cooperating with or initiating enforcement of a requirement in AS 18.35.301 - 18.35.366.

**Sec. 18.35.359. Conflicts with local requirements.** Nothing in AS 18.35.301 - 18.35.366 prohibits a municipality adopting and enforcing a law that establishes

(1) additional prohibitions on smoking; or

(2) additional duties for employers, owners, operators, and other

persons who are subject to the requirements of AS 18.35.331 related to smoking.

**Sec. 18.35.366. Definitions.** In AS 18.35.301 - 18.35.366,

(1) "business" means a for-profit or nonprofit sole proprietorship, partnership, joint venture, corporation, professional corporation, private club, retail seller of goods or services, or other business entity;

(2) "commissioner" means the commissioner of health and social services or the commissioner's designee;

(3) "department" means the Department of Health and Social Services;

(4) "e-cigarette" means an electronic device that uses a heating element, battery, or electronic circuit to issue a vapor for inhalation in a manner that simulates smoking a lighted or heated cigar, cigarette, or pipe, or other lighted or heated tobacco or plant product intended for inhalation;

(5) "employee" means a person who is employed by a business for compensation or works for a business as a volunteer without compensation;

(6) "employer" means the state, a municipality, a regional educational attendance area, and a person or a business with one or more employees;

(7) "enclosed area" means space between a floor and a ceiling that is bounded on two or more sides by a combination of walls, doorways, windows, or other physical barriers that may be open, partially open, closed, retractable, temporary, or permanent;

(8) "health care facility" means a private, municipal, or state hospital; independent diagnostic testing facility; primary care outpatient facility; skilled nursing facility; kidney disease treatment center, including freestanding hemodialysis units; intermediate care facility; ambulatory surgical facility; Alaska Pioneers' Home or Alaska Veterans' Home administered by the Department of Health and Social Services under AS 47.55; long-term care facility; psychiatric hospital; residential psychiatric treatment center, as defined in AS 18.07.111 or AS 47.32.900, and other facilities, places of employment or offices operated for use by doctors, nurses, surgeons, chiropractors, physical therapists, physicians, psychiatrists, or dentists or other professional health care providers to provide health care;

(9) "place of employment" means work areas, private offices, hotel and

motel rooms, employee lounges, restrooms, conference rooms, classrooms, cafeterias, hallways, vehicles and other employee work areas that are under the control of an employer;

(10) "private club" means a building or portion of a building used only for a recreational, fraternal, social, patriotic, political, benevolent, or athletic purpose by one organization that has been granted an exemption from the payment of federal income tax as a club under 26 U.S.C. 501 (Internal Revenue Code);

(11) "public place" means an area to which the public is invited or into which the public is permitted, including but not limited to, educational facilities, entertainment venues, food and beverage service establishments, offices, retail stores, and transportation facilities and vehicles accessible to the public; and

(12) "smoking" means using or operating an e-cigarette or other oral smoking device or inhaling, exhaling, or burning, a lighted or heated cigar, cigarette, or pipe or other lighted or heated tobacco or plant product intended for inhalation.

*** Sec. 2.** AS 18.35.300, 18.35.305, 18.35.310, 18.35.320, 18.35.330, 18.35.340, 18.35.341, 18.35.342, 18.35.343, 18.35.350, 18.35.355, and 18.35.365 are repealed.

*** Sec. 3.** The uncodified law of the State of Alaska is amended by adding a new section to read:

APPLICABILITY. AS 18.35.301 - 18.35.366, added by sec. 1 of this Act, apply to violations or failures to comply that occur on or after the effective date of sec. 1 of this Act.

*** Sec. 4.** The uncodified law of the State of Alaska is amended by adding a new section to read:

TRANSITION; REGULATIONS. The Department of Health and Social Services may adopt regulations necessary to implement AS 18.35.301 - 18.35.366, added by sec. 1 of this Act. The regulations take effect under AS 44.62 (Administrative Procedure Act), but not before the effective date of sec. 1 of this Act.

*** Sec. 5.** Section 4 of this Act takes effect immediately under AS 01.10.070(c).

*** Sec. 6.** Except as provided in sec. 5 of this Act, this Act takes effect October 1, 2014.

# Fiscal Note

State of Alaska
2014 Legislative Session

Bill Version: HB 360
Fiscal Note Number:
() Publish Date:

Identifier: HB360-DHSS-CO-03-21-14
Title: REGULATION OF SMOKING
Sponsor: HOLMES
Requester: House Health & Social Services Committee

Department: Department of Health and Social Services
Appropriation: Departmental Support Services
Allocation: Commissioner's Office
OMB Component Number: 317

**Expenditures/Revenues**

Note: Amounts do not include inflation unless otherwise noted below. (Thousands of Dollars)

| | FY2015 Appropriation Requested | Included in Governor's FY2015 Request | Out-Year Cost Estimates | | | | |
|---|---|---|---|---|---|---|---|
| **OPERATING EXPENDITURES** | **FY 2015** | **FY 2015** | **FY 2016** | **FY 2017** | **FY 2018** | **FY 2019** | **FY 2020** |
| Personal Services | *** | | *** | *** | *** | *** | *** |
| Travel | | | | | | | |
| Services | | | | | | | |
| Commodities | | | | | | | |
| Capital Outlay | | | | | | | |
| Grants & Benefits | | | | | | | |
| Miscellaneous | | | | | | | |
| **Total Operating** | *** | **0.0** | *** | *** | *** | *** | *** |

**Fund Source (Operating Only)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| None | | | | | | | |
| **Total** | *** | **0.0** | *** | *** | *** | *** | *** |

**Positions**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Full-time | | | | | | | |
| Part-time | | | | | | | |
| Temporary | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Change in Revenues** | | | | | | | |

**Estimated SUPPLEMENTAL (FY2014) cost:** 0.0 *(separate supplemental appropriation required)*
*(discuss reasons and fund source(s) in analysis section)*

**Estimated CAPITAL (FY2015) cost:** 0.0 *(separate capital appropriation required)*
*(discuss reasons and fund source(s) in analysis section)*

**ASSOCIATED REGULATIONS**

Does the bill direct, or will the bill result in, regulation changes adopted by your agency? Yes
If yes, by what date are the regulations to be adopted, amended or repealed? 10/01/15

**Why this fiscal note differs from previous version:**

Not applicable, initial version.


Prepared By: Kerre L. Shelton, Director — Phone: (907)269-2042
Division: Division of Public Health — Date: 03/21/2014 12:00 AM
Approved By: Sarah Woods, Deputy Director, Finance & Management Services — Date: 03/21/14
Agency: Health & Social Services

FISCAL NOTE ANALYSIS

STATE OF ALASKA
2014 LEGISLATIVE SESSION

BILL NO. HB360

## Analysis

This bill repeals Article 3 and adds a new Article 4 (Regulation of Smoking in Public), which designates the Department of Health and Social Services as responsible for enforcement. The new Article 4 prohibits smoking statewide in public enclosed areas, public transportation vehicles and facilities, places of employment, government owned or operated places, buildings or residences used to provide paid child care, health care facilities, school grounds or public parks for children, outdoor arena seating, and shore-based fishery marine vessels. Smoking is prohibited within certain distances from entrances, open windows, and air intake vents of places where smoking is prohibited. The Department of Environmental Conservation is currently responsible for enforcement of Article 3 of Chapter 18.35 (Regulation of Smoking in Public Facilities), but would cease to be.

If DHSS becomes the regulatory agency, a new smoking regulation and enforcement unit will have to be established, perhaps as part of the Commissioner's Office. Currently, enforcement is not a core function of any of the DHSS Divisions. Costs are indeterminate as the department does not currently have the infrastructure, expertise or internal capacity for enforcing compliance, and will need further clarification and research into what elements would be necessary. Staff would likely be needed to investigate complaints, issue citations, and follow up on all violations and penalties. The department would need to hold several public hearings around the state and extensive regulations would need to be developed during the first year.

The Division of Behavioral Health has limited responsibility for tobacco compliance through the Prevention and Early Intervention Section for the purpose of monitoring retail tobacco sales to minors. Three staff work with minors to conduct compliance operations to assure that tobacco retailers are not selling to minors. DBH engages in this activity to assure compliance with federal Substance Abuse Prevention and Treatment block grant regulations that require states to assure no more than 20% of tobacco sales involve minors. At one time Alaska's rate was over 30%, now it is 3%. This is a very targeted and specific compliance project required by federal Synar legislation.

Under section 18.36.356, the Division of Public Health's Tobacco Prevention and Control Program would be responsible for developing public education materials and educating business owners and the public on the specifics of the law. Signage for all state owned or operated buildings would be produced and distributed. Sample signage and information would also be provided to business owners online and distributed prior to the October 1, 2014 effective date. The public education work could be done with existing resources through an existing grant program in combination with ongoing comprehensive tobacco prevention and control efforts across the state.

# Fiscal Note

State of Alaska
2014 Legislative Session

Bill Version: HB 360
Fiscal Note Number:
() Publish Date:

Identifier: HB360-DOA-PUR-03-21-14
Title: REGULATION OF SMOKING
Sponsor: HOLMES
Requester: House Health and Social Services

Department: Department of Administration
Appropriation: General Services
Allocation: Purchasing
OMB Component Number: 60

**Expenditures/Revenues**

Note: Amounts do not include inflation unless otherwise noted below. (Thousands of Dollars)

| | FY2015 Appropriation Requested | Included in Governor's FY2015 Request | Out-Year Cost Estimates | | | | |
|---|---|---|---|---|---|---|---|
| **OPERATING EXPENDITURES** | **FY 2015** | **FY 2015** | **FY 2016** | **FY 2017** | **FY 2018** | **FY 2019** | **FY 2020** |
| Personal Services | | | | | | | |
| Travel | | | | | | | |
| Services | | | | | | | |
| Commodities | | | | | | | |
| Capital Outlay | | | | | | | |
| Grants & Benefits | | | | | | | |
| Miscellaneous | | | | | | | |
| **Total Operating** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |
| **Fund Source (Operating Only)** | | | | | | | |
| None | | | | | | | |
| **Total** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |
| **Positions** | | | | | | | |
| Full-time | | | | | | | |
| Part-time | | | | | | | |
| Temporary | | | | | | | |
| **Change in Revenues** | | | | | | | |

**Estimated SUPPLEMENTAL (FY2014) cost:** 0.0 *(separate supplemental appropriation required)*
*(discuss reasons and fund source(s) in analysis section)*

**Estimated CAPITAL (FY2015) cost:** 0.0 *(separate capital appropriation required)*
*(discuss reasons and fund source(s) in analysis section)*

**ASSOCIATED REGULATIONS**

Does the bill direct, or will the bill result in, regulation changes adopted by your agency? no
If yes, by what date are the regulations to be adopted, amended or repealed?

**Why this fiscal note differs from previous version:**

Not applicable, initial version


Prepared By: Tom Mayer, Director — Phone: (907)465-5677
Division: Division of General Services — Date: 03/21/2014 04:06 PM
Approved By: Curtis Thayer, Commissioner — Date: 03/21/2014
Agency: Division of General Services

FISCAL NOTE ANALYSIS

STATE OF ALASKA
2014 LEGISLATIVE SESSION

BILL NO. HB 360

## Analysis

HB360 requires no smoking signs be posted in public buildings and public transportation vehicles.

The impact to the Division of General Services will be minimal and therefore submits a zero fiscal note.

# Fiscal Note

State of Alaska
2014 Legislative Session

Bill Version: HB 360
Fiscal Note Number:
() Publish Date:

Identifier: HB360-DOT-IASO-3-21-14
Title: REGULATION OF SMOKING
Sponsor: HOLMES
Requester: House Health & Social Services

Department: Department of Transportation and Public Facilities
Appropriation: International Airports
Allocation: International Airport Systems Office
OMB Component Number: 1649

**Expenditures/Revenues**

Note: Amounts do not include inflation unless otherwise noted below. (Thousands of Dollars)

| | FY2015 Appropriation Requested | Included in Governor's FY2015 Request | Out-Year Cost Estimates | | | | |
|---|---|---|---|---|---|---|---|
| **OPERATING EXPENDITURES** | **FY 2015** | **FY 2015** | **FY 2016** | **FY 2017** | **FY 2018** | **FY 2019** | **FY 2020** |
| Personal Services | | | | | | | |
| Travel | | | | | | | |
| Services | | | | | | | |
| Commodities | 32.3 | | 3.2 | 3.2 | 3.2 | 3.2 | 3.2 |
| Capital Outlay | | | | | | | |
| Grants & Benefits | | | | | | | |
| Miscellaneous | | | | | | | |
| **Total Operating** | **32.3** | **0.0** | **3.2** | **3.2** | **3.2** | **3.2** | **3.2** |
| **Fund Source (Operating Only)** | | | | | | | |
| 1027 IntAirport | 32.3 | | 3.2 | 3.2 | 3.2 | 3.2 | 3.2 |
| **Total** | **32.3** | **0.0** | **3.2** | **3.2** | **3.2** | **3.2** | **3.2** |
| **Positions** | | | | | | | |
| Full-time | | | | | | | |
| Part-time | | | | | | | |
| Temporary | | | | | | | |
| **Change in Revenues** | | | | | | | |

**Estimated SUPPLEMENTAL (FY2014) cost:** 0.0 *(separate supplemental appropriation required)*
*(discuss reasons and fund source(s) in analysis section)*

**Estimated CAPITAL (FY2015) cost:** 0.0 *(separate capital appropriation required)*
*(discuss reasons and fund source(s) in analysis section)*

**ASSOCIATED REGULATIONS**

Does the bill direct, or will the bill result in, regulation changes adopted by your agency? No
If yes, by what date are the regulations to be adopted, amended or repealed?

**Why this fiscal note differs from previous version:**

Initial version.


Prepared By: Connie McKenzie, Legislative Liaison Phone: (907)465-4772
Division: Office of the Commissioner Date: 03/21/2014 04:40 PM
Approved By: Mary Siroky, Administrative Director Date: 03/21/14
Agency: Department of Transportation and Public Facilities

FISCAL NOTE ANALYSIS

STATE OF ALASKA
2014 LEGISLATIVE SESSION

BILL NO. HB360

## Analysis

This legislation would ban smoking on Fairbanks International Airport and on Ted Stevens Anchorage International Airport property to include buildings and outdoor spaces. The legislation specifically states "airports" which does not distinguish between the airport terminal and outdoor space.

Title 17 currently prohibits smoking within 50 ft of an aircraft on airport property. The international airports follow municipal codes prohibiting smoking in public buildings and displays signage and has periodic public address system announcements in the terminals.

Currently smokers are provided with a designated outside smoking area adjacent to the terminals but away from any building entrances. A smoking room equipped with ventilation is provided in the North Terminal of the Ted Stevens Anchorage International Airport for passengers that deplane and cannot leave the terminal secure area before re-boarding their through-flight (some international flights and military charters).

With the passage of this legislation, the airport will be required to discontinue providing smokers a designated outdoor smoking area, discontinue the use of the north terminal smoking room, remove current no-smoking signage and replace with new signs at the terminal and numerous other state managed buildings and display signs outdoors in highly visible locations.

Total 150 stand-alone 18" x 24" signs ($215/sign and post)

| | | |
|---|---|---|
| Ted Stevens Anchorage International Airport | 100 signs | $21.5 |
| Fairbanks International Airport | 50 signs | $10.8 |
| Total one time cost | 150 signs | $32.3 |
| Cost per year to replace stolen/damage/worn signs | 15 signs | $3.2 |

# Fiscal Note

State of Alaska
2014 Legislative Session

Bill Version: HB 360
Fiscal Note Number:
() Publish Date:

Identifier: HB360-DOT-MVO-3-21-14
Title: REGULATION OF SMOKING
Sponsor: HOLMES
Requester: House Health & Social Services

Department: Department of Transportation and Public Facilities
Appropriation: Marine Highway System
Allocation: Marine Vessel Operations
OMB Component Number: 2604

**Expenditures/Revenues**

Note: Amounts do not include inflation unless otherwise noted below. (Thousands of Dollars)

| | FY2015 Appropriation Requested | Included in Governor's FY2015 Request | Out-Year Cost Estimates | | | | |
|---|---|---|---|---|---|---|---|
| **OPERATING EXPENDITURES** | **FY 2015** | **FY 2015** | **FY 2016** | **FY 2017** | **FY 2018** | **FY 2019** | **FY 2020** |
| Personal Services | | | | | | | |
| Travel | | | | | | | |
| Services | | | | | | | |
| Commodities | 7.3 | | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Capital Outlay | | | | | | | |
| Grants & Benefits | | | | | | | |
| Miscellaneous | | | | | | | |
| **Total Operating** | **7.3** | **0.0** | **1.0** | **1.0** | **1.0** | **1.0** | **1.0** |
| **Fund Source (Operating Only)** | | | | | | | |
| 1004 Gen Fund | 7.3 | | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| **Total** | **7.3** | **0.0** | **1.0** | **1.0** | **1.0** | **1.0** | **1.0** |
| **Positions** | | | | | | | |
| Full-time | | | | | | | |
| Part-time | | | | | | | |
| Temporary | | | | | | | |
| **Change in Revenues** | | | | | | | |

**Estimated SUPPLEMENTAL (FY2014) cost:** 0.0 *(separate supplemental appropriation required)*
*(discuss reasons and fund source(s) in analysis section)*

**Estimated CAPITAL (FY2015) cost:** 0.0 *(separate capital appropriation required)*
*(discuss reasons and fund source(s) in analysis section)*

**ASSOCIATED REGULATIONS**

Does the bill direct, or will the bill result in, regulation changes adopted by your agency? No.
If yes, by what date are the regulations to be adopted, amended or repealed?

**Why this fiscal note differs from previous version:**

Initial version.

| | | | |
|---|---|---|---|
| Prepared By: | Connie McKenzie, Legislative Liaison | Phone: | (907)465-4772 |
| Division: | Office of the Commissioner | Date: | 03/21/2014 04:30 PM |
| Approved By: | Mary Siroky, Director, Administrative Services | Date: | 03/21/14 |
| Agency: | Department of Transportation and Public Facilities | | |

FISCAL NOTE ANALYSIS

STATE OF ALASKA
2014 LEGISLATIVE SESSION

BILL NO. HB360

## Analysis

This bill would ban smoking onboard the Alaska Marine Highway System (AMHS) ferries. The legislation does not distinguish between indoor and outdoor spaces on the vessels, however the AMHS currently prohibits smoking inside of the vessel.

Currently outdoor smoking is prohibited in certain proximity to places such as doorways, windows and vents, but with the passage of this legislation even outdoor smoking will be prohibited.

With the passage of this legislation, the AMHS will be required to post signs at terminals and loading ramps as well as onboard the 11 vessels of the fleet. Current no-smoking signs will have to be replaced with new signs citing the increased fine.

| | |
|---|---|
| 26 stand-alone 18" x 24" signs at terminals and loading ramps | $5.6 |
| 66 (6 per vessel) 12" x 12" signs onboard | $1.7 |
| Total one time cost | $7.3 |
| | |
| Cost per year to replace stolen/damage/worn signs | $1.0 |

# Fiscal Note

State of Alaska
2014 Legislative Session

Bill Version: HB 360
Fiscal Note Number:
() Publish Date:

Identifier: HB360-DOT-TMS-3-21-14
Title: REGULATION OF SMOKING
Sponsor: HOLMES
Requester: House Health & Social Services

Department: Department of Transportation and Public Facilities
Appropriation: Administration and Support
Allocation: Transportation Management and Security
OMB Component Number: 2607

**Expenditures/Revenues**

Note: Amounts do not include inflation unless otherwise noted below. (Thousands of Dollars)

| | FY2015 Appropriation Requested | Included in Governor's FY2015 Request | Out-Year Cost Estimates | | | | |
|---|---|---|---|---|---|---|---|
| **OPERATING EXPENDITURES** | **FY 2015** | **FY 2015** | **FY 2016** | **FY 2017** | **FY 2018** | **FY 2019** | **FY 2020** |
| Personal Services | | | | | | | |
| Travel | | | | | | | |
| Services | 92.5 | | 9.3 | 9.3 | 9.3 | 9.3 | 9.3 |
| Commodities | 29.3 | | 2.9 | 2.9 | 2.9 | 2.9 | 2.9 |
| Capital Outlay | | | | | | | |
| Grants & Benefits | | | | | | | |
| Miscellaneous | | | | | | | |
| **Total Operating** | **121.8** | **0.0** | **12.2** | **12.2** | **12.2** | **12.2** | **12.2** |
| **Fund Source (Operating Only)** | | | | | | | |
| 1004 Gen Fund | 121.8 | | 12.2 | 12.2 | 12.2 | 12.2 | 12.2 |
| **Total** | **121.8** | **0.0** | **12.2** | **12.2** | **12.2** | **12.2** | **12.2** |
| **Positions** | | | | | | | |
| Full-time | | | | | | | |
| Part-time | | | | | | | |
| Temporary | | | | | | | |
| **Change in Revenues** | | | | | | | |

**Estimated SUPPLEMENTAL (FY2014) cost:** 0.0 *(separate supplemental appropriation required)*
*(discuss reasons and fund source(s) in analysis section)*

**Estimated CAPITAL (FY2015) cost:** 0.0 *(separate capital appropriation required)*
*(discuss reasons and fund source(s) in analysis section)*

**ASSOCIATED REGULATIONS**

Does the bill direct, or will the bill result in, regulation changes adopted by your agency? No
If yes, by what date are the regulations to be adopted, amended or repealed?

**Why this fiscal note differs from previous version:**

Initial version.

| | | | |
|---|---|---|---|
| Prepared By: | Connie McKenzie, Legislative Liaison | Phone: | (907)465-4772 |
| Division: | Office of the Commissioner | Date: | 03/21/2014 04:30 PM |
| Approved By: | Mary P. Siroky, Director, Administrative Services | Date: | 03/21/14 |
| Agency: | Department of Transportation and Public Facilities | | |

FISCAL NOTE ANALYSIS

STATE OF ALASKA
2014 LEGISLATIVE SESSION

BILL NO. HB360

## Analysis

This legislation would ban smoking on all State of Alaska airport property. The bill specifies no smoking at "airports" and does not distinguish between airport terminals and outdoor areas. Signage would be included at all 254 state-owned airports to notify anyone entering airport property that smoking is not allowed.

Total 349 stand-alone 6" x 20" signs ($349/sign, includes post, installation & shipping )

| | | |
|---|---|---|
| Northern Region Highways & Aviation | 159 signs | $55.5 |
| Central Region Highways & Aviation | 140 signs | $48.9 |
| Southeast Region Highways & Aviation | 50 signs | $17.4 |
| Total one time cost | 349 signs | $121.8 |
| Cost per year to replace stolen/damage/worn signs | 35 signs | $12.2 |

# Fiscal Note

State of Alaska
2014 Legislative Session

Bill Version: HB 360
Fiscal Note Number:
() Publish Date:

Identifier: HB360-DOT-SEF-3-21-14
Title: REGULATION OF SMOKING
Sponsor: HOLMES
Requester: House Health & Social Services

Department: Department of Transportation and Public Facilities
Appropriation: State Equipment Fleet
Allocation: State Equipment Fleet
OMB Component Number: 2791

**Expenditures/Revenues**

Note: Amounts do not include inflation unless otherwise noted below. (Thousands of Dollars)

| | FY2015 Appropriation Requested | Included in Governor's FY2015 Request | Out-Year Cost Estimates | | | | |
|---|---|---|---|---|---|---|---|
| **OPERATING EXPENDITURES** | **FY 2015** | **FY 2015** | **FY 2016** | **FY 2017** | **FY 2018** | **FY 2019** | **FY 2020** |
| Personal Services | | | | | | | |
| Travel | | | | | | | |
| Services | | | | | | | |
| Commodities | 1.5 | | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| Capital Outlay | | | | | | | |
| Grants & Benefits | | | | | | | |
| Miscellaneous | | | | | | | |
| **Total Operating** | **1.5** | **0.0** | **1.5** | **1.5** | **1.5** | **1.5** | **1.5** |
| **Fund Source (Operating Only)** | | | | | | | |
| 1026 HwyCapital | 1.5 | | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **Total** | **1.5** | **0.0** | **1.5** | **1.5** | **1.5** | **1.5** | **1.5** |
| **Positions** | | | | | | | |
| Full-time | | | | | | | |
| Part-time | | | | | | | |
| Temporary | | | | | | | |
| **Change in Revenues** | | | | | | | |

**Estimated SUPPLEMENTAL (FY2014) cost:** 0.0 *(separate supplemental appropriation required)*
*(discuss reasons and fund source(s) in analysis section)*

**Estimated CAPITAL (FY2015) cost:** 0.0 *(separate capital appropriation required)*
*(discuss reasons and fund source(s) in analysis section)*

**ASSOCIATED REGULATIONS**

Does the bill direct, or will the bill result in, regulation changes adopted by your agency? No
If yes, by what date are the regulations to be adopted, amended or repealed?

**Why this fiscal note differs from previous version:**

Initial version.

| | | | |
|---|---|---|---|
| Prepared By: | Connie McKenzie, Legislative Liaison | Phone: | (907)465-4772 |
| Division: | Office of the Commissioner | Date: | 03/21/2014 04:30 PM |
| Approved By: | Mary P. Siroky, Director, Administrative Services | Date: | 03/21/14 |
| Agency: | Department of Transportation and Public Facilities | | |

FISCAL NOTE ANALYSIS

STATE OF ALASKA
2014 LEGISLATIVE SESSION

BILL NO. HB360

## Analysis

This legislation would ban smoking in state-owned vehicles under (a)(4) - other enclosed area in a place of employment.

5653 vehicles in the state equipment fleet
$1.5 for decals for each state equipment fleet vehicle

This fiscal note assumes that the decals would need to be replaced annually.

# Fiscal Note

State of Alaska
2014 Legislative Session

Bill Version: HB 360
Fiscal Note Number:
() Publish Date:

Identifier: HB360-DEC-FSS-03-21-14
Title: REGULATION OF SMOKING
Sponsor: HOLMES
Requester: House Health & Social Services Committee

Department: Department of Environmental Conservation
Appropriation: Environmental Health
Allocation: Food Safety & Sanitation
OMB Component Number: 2343

**Expenditures/Revenues**

Note: Amounts do not include inflation unless otherwise noted below. (Thousands of Dollars)

| | FY2015 Appropriation Requested | Included in Governor's FY2015 Request | Out-Year Cost Estimates | | | | |
|---|---|---|---|---|---|---|---|
| **OPERATING EXPENDITURES** | **FY 2015** | **FY 2015** | **FY 2016** | **FY 2017** | **FY 2018** | **FY 2019** | **FY 2020** |
| Personal Services | | | | | | | |
| Travel | | | | | | | |
| Services | | | | | | | |
| Commodities | | | | | | | |
| Capital Outlay | | | | | | | |
| Grants & Benefits | | | | | | | |
| Miscellaneous | | | | | | | |
| **Total Operating** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |

**Fund Source (Operating Only)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| None | | | | | | | |
| **Total** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |

**Positions**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Full-time | | | | | | | |
| Part-time | | | | | | | |
| Temporary | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Change in Revenues** | | | | | | | |

**Estimated SUPPLEMENTAL (FY2014) cost:** 0.0 *(separate supplemental appropriation required)*
*(discuss reasons and fund source(s) in analysis section)*

**Estimated CAPITAL (FY2015) cost:** 0.0 *(separate capital appropriation required)*
*(discuss reasons and fund source(s) in analysis section)*

**ASSOCIATED REGULATIONS**

Does the bill direct, or will the bill result in, regulation changes adopted by your agency? No
If yes, by what date are the regulations to be adopted, amended or repealed?

**Why this fiscal note differs from previous version:**

Not applicable, initial version.


Prepared By: Elaine Busse Floyd, Director — Phone: (907)269-7645
Division: Environmental Health — Date: 03/21/2014 10:30 AM
Approved By: Lynn Kent, Deputy Commissioner — Date: 03/21/14
Agency: Department of Environmental Conservation

FISCAL NOTE ANALYSIS

STATE OF ALASKA
2014 LEGISLATIVE SESSION

BILL NO. HB 360

## Analysis

**Analysis/Assumptions:**
This legislation transfers the administration and enforcement authority out of the Department of Environmental Conservation (DEC) and into the Department of Health & Social Services (HSS). Current enforcement activities are limited to ensuring that facilities are compliant during routine inspections, so there are no cost savings to DEC by transferring enforcement authority to HSS.

CA
A Cancer Journal for Clinicians

**The Economic Impact of Clean Indoor Air Laws**

Michael Eriksen and Frank Chaloupka

*CA Cancer J Clin* 2007;57;367-378
DOI: 10.3322/CA.57.6.367



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CA Cancer J Clin 2007;57:367–378

# The Economic Impact of Clean Indoor Air Laws

*Michael Eriksen, ScD; Frank Chaloupka, PhD*

ABSTRACT Clean indoor air laws are easily implemented, are well accepted by the public, reduce nonsmoker exposure to secondhand smoke, and contribute to a reduction in overall cigarette consumption. There are currently thousands of clean indoor air laws throughout the Unites States, and the majority of Americans live in areas where smoking is completely prohibited in workplaces, restaurants, or bars. The vast majority of scientific evidence indicates that there is no negative economic impact of clean indoor air policies, with many studies finding that there may be some positive effects on local businesses. This is despite the fact that tobacco industry-sponsored research has attempted to create fears to the contrary. Further progress in the diffusion of clean indoor air laws will depend on the continued documentation of the economic impact of clean indoor air laws, particularly within the hospitality industry. This article reviews the spread of clean indoor air laws, the effect on public health, and the scientific evidence of the economic impact of implementation of clean indoor air laws. (*CA Cancer J Clin 2007;57:367–378.*) 

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**Dr. Chaloupka** is Distinguished Professor, Health Policy Center and Department of Economics, University of Illinois at Chicago, Chicago, IL.

This article is available online at http://CAonline.AmCancerSoc.org

**DOI: 10.3322/CA.57.6.367**

## THE SPREAD OF CLEAN INDOOR AIR LAWS

States and localities have restricted smoking in a variety of places for many years. The earliest policies usually restricted smoking in a few venues (eg, theaters or food preparation areas) and were intended to prevent fires or food contamination rather than to protect the health of nonsmokers. As evidence emerged about the health consequences of smoking, including limited evidence on the consequences of exposure of nonsmokers to tobacco smoke, the public health community and advocates called for protection from exposure to secondhand smoke. In 1971, Surgeon General Jesse Steinfeld called for a complete ban on smoking in confined public places and went on to tell the Interagency Committee on Smoking and Health, "Nonsmokers have as much right to clean air and wholesome air as smokers have to their so-called right to smoke, which I would define as a 'right to pollute.' It is high time to ban smoking from all confined public places such as restaurants, theaters, airplanes, trains and buses."[1]

The next year, Surgeon General Steinfeld released the 1972 Surgeon General's Report[2] and sparked national awareness of the possible adverse health effects due to "public exposure to air pollution from tobacco smoke."

Policy makers ultimately listened and adopted new policies limiting smoking, with the specific intent of protecting nonsmokers. The earliest of these state policies was the 1973 law in Arizona that limited smoking in a number of public places. This was soon followed by the 1974 Connecticut law restricting smoking in restaurants and the 1975 Minnesota law that was the first comprehensive clean indoor air law that included restrictions on smoking in private workplaces.[3]

Perhaps surprisingly given that California has been at the leading edge of state tobacco-control efforts, statewide clean indoor air referenda were defeated in California in 1978 and 1980. These defeats resulted in a shift from statewide to local efforts to restrict public smoking in the state. In the early 1980s, local clean indoor air ordinances were passed in San Francisco, Los Angeles, Sacramento, and San Diego. This focus on local municipalities started in California and spread throughout the nation.

Disclosures: The authors would like to acknowledge the support of the Georgia Cancer Coalition (M.P.E.) and the Robert Wood Johnson Foundation's ImpacTeen project (F.J.C.) for conducting the research to prepare this manuscript.

As public advocacy and scientific discovery advanced, the tobacco industry took note. In 1978, the Tobacco Institute commissioned the Roper Organization to conduct a national public-opinion survey on smoking.[4] The Roper Organization warned the Tobacco Institute that the tobacco industry should give serious consideration to public concerns about secondhand smoke, stating, "...what the smoker does to himself may be his business, but what the smoker does to the nonsmoker is quite a different matter." The Roper Report went on to conclude the following:

"Nearly six out of ten believe that smoking is hazardous to the nonsmoker's health, up sharply over the last four years. More than two-thirds of nonsmokers believe it and nearly one half of all smokers believe it. This we see as the most dangerous development to the viability of the tobacco industry that has yet occurred."[4]

Momentum for clean indoor air policies grew following the release of the 1986 Surgeon General's report, *The Health Consequences of Involuntary Smoking*, which concluded that exposure to tobacco smoke caused diseases, including lung cancer, and that children of smoking parents were at increased risk of respiratory diseases.[3] Importantly, the report concluded that the simple separation of smokers and nonsmokers might reduce but did not eliminate the health risks from nonsmokers' exposure to tobacco smoke. In the years following the report, new federal regulations were adopted banning smoking on domestic flights of 2 hours or fewer and, eventually, virtually all domestic flights (in 1990) and all international flights departing from or arriving in the United States (in 2000). The report spurred more action at the state and local level as governments strengthened existing policies and adopted new policies, including complete bans on smoking in some venues (eg, health care facilities). At the same time, it led numerous private companies to adopt policies governing smoking in their workplaces. Much of the push for strong state and local policies was the result of effective grassroots advocacy efforts of groups like the Americans for Nonsmokers' Rights Foundation and the coalitions supported by the American Stop Smoking Intervention Study and SmokeLess States programs.[3]

As evidence grew about the health consequences of exposure to tobacco smoke, state and local policies became stronger and stronger. The 1997 release of the California Environmental Protection Agency's report on the health consequences of exposure[5] was followed in 1998 by California's law banning smoking in bars without separately ventilated smoking areas. In 2002, New York City made history by banning smoking in bars, restaurants, and virtually all other workplaces beginning in July 2003, while Florida voters overwhelmingly supported a ballot initiative that with some exceptions (most notably bars) did the same. By 2003, every state and thousands of localities had adopted policies limiting or banning smoking in a variety of locales. The growth and strengthening of these state policies is illustrated in Figure 1.

Most recently, the 2006 Surgeon General's Report, *The Health Consequences of Involuntary Exposure to Tobacco Smoke*,[3] stimulated further action, leading a growing number of states and communities to adopt comprehensive bans on cigarette smoking in virtually all public places and private worksites. In some places, these policies have included some outdoor spaces (eg, sports stadiums, beaches, and public parks). As of July 2007, 23 states, Puerto Rico, and Washington, DC, have laws in effect that require 100% smoke-free workplaces, restaurants, or bars (or some combination thereof), with another 6 states having enacted similar laws that are not yet in effect. There are also over 2,500 municipalities with clean indoor air laws.[6] The growth in these comprehensive policies since 1985 is illustrated in Figure 2.

These comprehensive state policies (including those scheduled to take effect in the future), along with comparable local policies, currently apply to well over half of the US population.[6] Further limits on smoking are being considered, including extending the policies to a greater variety of outdoor spaces and prohibiting smoking in private cars when children are present. In addition, as awareness of the health consequences of exposure to tobacco smoke grew and as public and private policies were implemented and strengthened, a growing number of households, including those of smokers, have adopted rules governing smoking in the home. By 2003, nearly

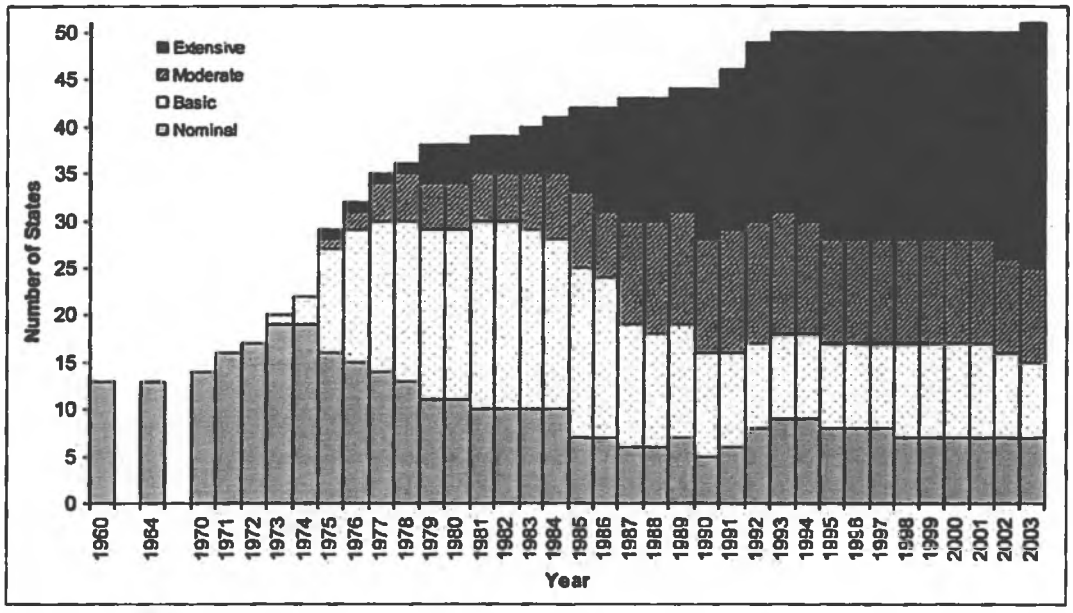


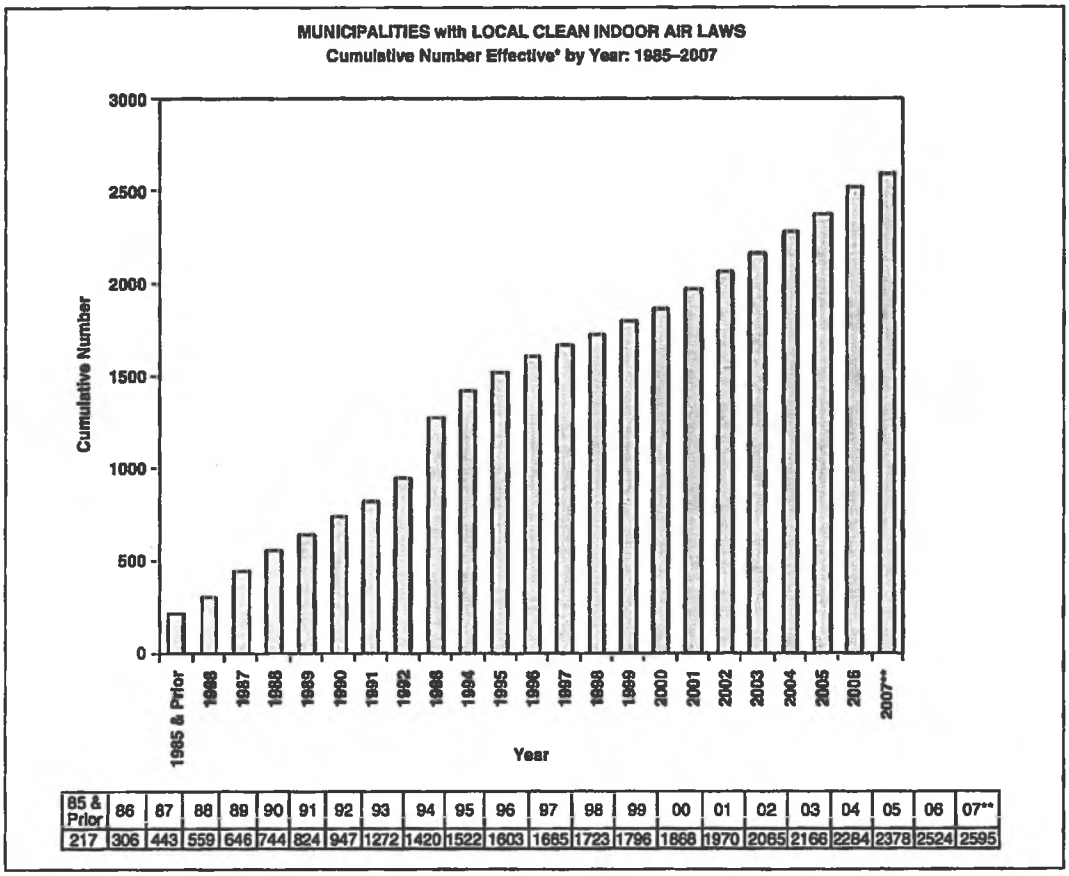

FIGURE 1 Restrictiveness of State Laws Regulating Smoking in Public Places, 1960 to 2003. Note: classification scheme from 1989 Surgeon General's Report (US Department of Health and Human Services, 1989) used to define restrictiveness as follows: nominal indicates 1 to 3 public places, not including restaurants or worksites; basic, 4 or more public places, not including restaurants or worksites; moderate, regulates smoking in restaurants, but not worksites; extensive, regulates smoking in private worksites. Figure courtesy of Roswell Park Cancer Institute and the ImpacTeen Project.

three fourths of US households had smoke-free home rules in place.[7]

## GLOBAL CLEAN INDOOR AIR LAWS

In March 2004, Ireland became the first country to implement laws prohibiting smoking in enclosed workplaces, including bars and restaurants. Although some feared that the policy would be harmful to the economy and that people would not adhere to the law, the majority of the public supported the ban, and over 26,000 inspections reported a 94% compliance level.[8] In addition, there was an 11% increase in the number of customers who visited Dublin pubs after the ban.[9] Other studies have supported positive findings from Ireland's ban, including the following: (1) increase of public support of smoke-free laws from 67% to 89%, (2) increase of support from smokers from 40% to 70%, (3) high compliance to the smoke-free laws, (4) decreases of particulate concentrations and benzene levels in indoor air, and (5) improvements in nonsmokers' pulmonary functions.[10] Since the enactment of Ireland's smoke-free laws, other countries have followed suit or are planning to do so, such as New Zealand, Bermuda, Iran, Italy, South Africa, Finland, and others.[11]

On May 21, 2003, the world's first international public health treaty, the Framework Convention on Tobacco Control (FCTC), was adopted unanimously by the World Health Assembly. Article 8 of the FCTC addresses secondhand-smoke exposure as a health risk and identifies interventions to reduce the exposure. The FCTC calls for ratifying parties to implement clean indoor air laws that will protect citizens from secondhand-smoke exposure in indoor workplaces and public places.[12] On August 14, 2007, Grenada became the 149th country to ratify the FCTC.[13] Unfortunately, while the United States signed the treaty in May 2004, it has not yet been sent to the Senate for ratification. At the second meeting of the Conference of Parties in July 2007 in Bangkok, the countries that ratified the FCTC adopted standards for implementation of the smoke-free provisions as outlined in Article 8 of the FCTC. The standards acknowledge that only 100% smoke-free environments provide effective protection from secondhand




| 85 & Prior | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 217 | 306 | 443 | 559 | 646 | 744 | 824 | 947 | 1272 | 1420 | 1522 | 1603 | 1665 | 1723 | 1796 | 1868 | 1970 | 2085 | 2166 | 2284 | 2378 | 2524 | 2595 |

FIGURE 2 Municipalities with Local Clean Indoor Air Laws, Cumulative Number Effective* by Year: 1985–2007.
*Includes ordinances effective for any part of the year (ie, if an ordinance was effective for the first half of 2001, but then repealed halfway through the year, that ordinance still gets counted in 2001 since it was in effect for part of the year).[8]
**Year to date.
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smoke and that there is no safe level of exposure, which is consistent with the conclusions of the 2006 Surgeon General's Report.[14]

## PROGRESS IN REDUCING EXPOSURE TO SECONDHAND SMOKE

Not only have clean indoor air laws become prevalent, their implementation has had a positive effect on public health. For example, Healthy People 2010 has established objectives to help achieve the goal of reducing illness, disability, and death related to tobacco use and exposure to secondhand smoke.[15] There are 17 specific objectives, with 5 pertaining to reducing exposure to secondhand smoke in the United States. During the Healthy People 2010 Midcourse Review,[16] progress toward all the tobacco objectives was assessed, and the *only* objective that was actually met was reducing the proportion of nonsmokers exposed to secondhand smoke from 88% to 54% (Objective 27–10), exceeding its target by 36%.

The Centers for Disease Control and Prevention's *Third National Report on Human Exposure to Environmental Chemicals*[17] shows that the presence of serum cotinine in nonsmokers has decreased dramatically over the past decade. Cotinine is a metabolite of nicotine and is primarily present in nonsmokers as a result of inhaling secondhand tobacco smoke. Compared with 1988 to 1991, the 1999 to 2002 data illustrate that cotinine levels in nonsmokers have decreased by approximately 70% (see Figure 3).[18] These investigators reported that nearly all (88%) of nonsmokers had measurable levels of cotinine in their blood in 1988 to 1991, but

only 43% had measurable cotinine levels in 1999 to 2002.

To better understand the reason for this precipitous drop in serum cotinine levels since 1988, Pickett and her colleagues[20] analyzed the National Health and Nutrition Examination Survey data in the 57 locations in which the survey was conducted and compared serum cotinine levels in relation to the presence of clean indoor air laws. These investigators found a dose-response relationship between exposure to secondhand smoke (as measured by serum cotinine) and the extensiveness of the clean indoor air law in the subject's county of residence. In counties with extensive laws, 12.5% of the residents had serum cotinine levels consistent with secondhand smoke exposure compared with 35.1% in counties with limited coverage and 45.9% in counties with no clean indoor air law at all. Recent data from New York State indicate a reduction of nearly 50% in serum cotinine levels following the implementation of a comprehensive statewide smoking ban and an increase from under one third to over one half of the study population with undetectable levels of cotinine.[21]

In general, research suggests that these policies are self-enforcing and that compliance is high within a short time after their implementation.[22,23] As a result, these policies are highly effective in reducing nonsmokers' exposure to tobacco smoke.[3,24] Somewhat surprisingly perhaps, even many smokers residing in communities with comprehensive smoke-free policies indicate that they support such bans.[23] For example, in one recent survey, 83% of Irish smokers indicated that the comprehensive smoking ban implemented in Ireland in March 2004 was a good or very good policy.[25]

In addition to protecting nonsmokers from exposure to tobacco smoke, these policies are effective in reducing cigarette smoking both by encouraging adult smokers to quit smoking and preventing youth from initiating smoking. These reductions result, in part, from the strengthening of social norms against smoking that follows the adoption of these policies, as well as from limiting opportunities for smoking and raising the "costs" of smoking (eg, the inconvenience or discomfort associated with smoking outdoors). Comprehensive reviews of the research evidence

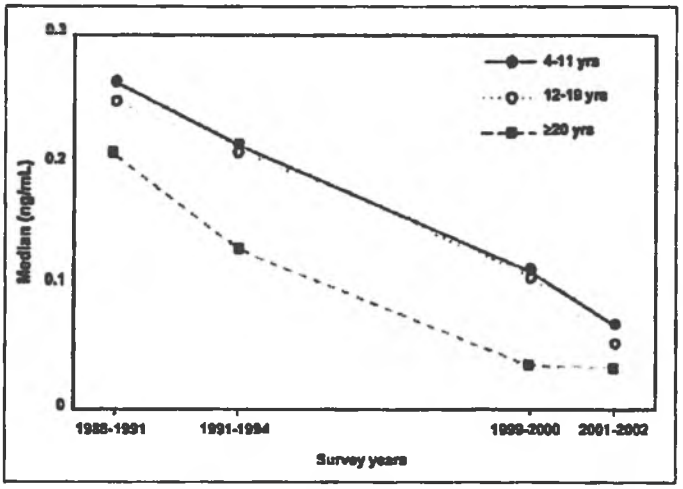


FIGURE 3 Median Serum Cotinine Levels in Nonsmokers, by Age Group—National Health and Nutrition Examination Survey (NHANES), United States, 1988–1991 through 2001–2002.[18] Reprinted with permission from the Centers for Disease Control and Prevention, Department of Health and Human Services.[19]

on the impact of smoke-free workplace policies by the National Cancer Institute,[26] the Task Force on Community Preventive Services,[24,27] and the Surgeon General[3] find that these policies are effective in inducing some smokers to quit smoking and in reducing the number of cigarettes consumed by some smokers who continue to smoke.

Likewise, among youth and young adults, these policies are associated with stronger perceptions of the risks from smoking and lower perceived smoking prevalence among adults. These factors and the increased "costs" of smoking associated with the policies help explain the consistent findings from a growing number of studies showing that comprehensive smoke-free air policies are effective in reducing youth smoking prevalence, initiation, and uptake.[3]

The association between state smoke-free air policies and adult smoking prevalence is illustrated in Figure 4. While this simple graph does not control for the other factors that affect smoking prevalence or for the potential reverse causality between prevalence and state policies, it is consistent with the extensive and growing body of research that does take these into account. The figure uses an index developed by the ImpacTeen project that reflects both the number of places covered by state smoke-free air policies and the extent of the restrictions in each of these places (ranging from no restrictions to a complete ban).

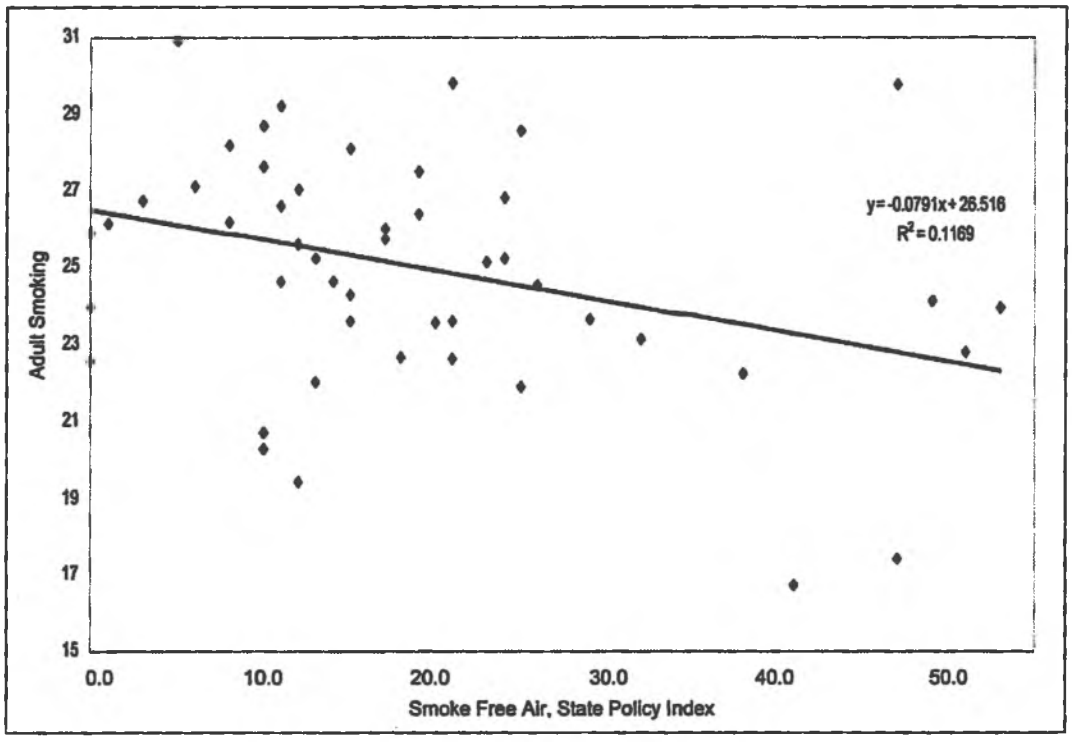


FIGURE 4 Strength of Smoke-free Air Policies and Adult Smoking Prevalence, 2003 to 2004. Figure courtesy of Substance Abuse and Mental Health Services Administration, Roswell Park Cancer Institute, and the ImpacTeen Project.

The actual experience in implementing clean indoor air laws has confirmed the anticipated public health benefit. Levy and colleagues[28] estimate that state clean indoor air laws adopted between 1993 and 2003 accounted for about 9% of the decline in adult smoking prevalence during this period. Levy[29] further predicts that prevalence would decline by an additional 4.2% by 2025 if all states that had not implemented comprehensive clean indoor air laws by the end of 2005 did so. While not the subject of this review, the 2006 Surgeon General's Report reviews the health benefits to nonsmokers as a result of reducing exposure to secondhand smoke and concludes "... that smoke-free workplace laws appear to yield health benefits soon after implementation."[3] As with active smoking, the health benefits associated with clean indoor air laws can be simply attributed to reduced exposure to the toxins contained in tobacco smoke. For example, a recent study in the Pacific Northwest found significantly higher levels of a tobacco-specific lung carcinogen (NNAL) in nonsmoking bar and restaurant workers exposed to secondhand smoke compared with workers employed in smoke-free establishments.[30]

## THE ECONOMIC COSTS OF EXPOSURE TO SECONDHAND SMOKE

In addition to the morbidity and mortality associated with chronic exposure to secondhand smoke, there are also real and substantial economic costs. In 2005, the Society of Actuaries[31] analyzed the costs associated with involuntary exposure to secondhand smoke and concluded that such exposure imposes significant costs on nonsmokers and society as a whole. Total annual costs for conditions with well-documented increases in morbidity are estimated at nearly $5 billion in direct medical costs and nearly $5 billion in indirect costs (See Table 1).

## ECONOMIC IMPACT OF SMOKE-FREE AIR LAWS

The spread of smoke-free air policies at the local, state, and national levels has been slowed by concerns about the economic impact of these

TABLE 1 Estimated Annual Direct Medical Cost and Economic Value of Lost Wages, Fringe Benefits, and Services for the Nonsmoking US Population Based on Present Value[31]

| Major Disease Category | Specific Health Condition | Medical Cost ($1,000,000) | Indirect Costs ($1,000,000) | Total Annual US Combined Costs ($1,000,000) |
|---|---|---|---|---|
| Cancer | Lung cancer | 191 | 469 | 660 |
| Cancer | Cervical cancer | 14 | 110 | 124 |
| Respiratory system | Asthma | 773 | 161 | 934 |
| Respiratory system | Otitis media | 53 | N/A | 53 |
| Respiratory system | Chronic obstructive pulmonary disease | 1,215 | 886 | 2,101 |
| Cardiovascular system | Coronary heart disease | 2,452 | 2,752 | 5,204 |
| Perinatal manifestations | Low birth weight | 284 | 174 | 458 |
| Postnatal manifestations | Sudden infant death syndrome | N/A | 131 | 131 |
| Total | | 4,982 | 4,683 | 9,665 |

N/A = not applicable.

policies, particularly on the hospitality industry. Some restaurant and bar owners, for example, thought that smoking restrictions or bans would result in lost revenues as their smoking patrons would cut short their stay or seek other venues (including those in other jurisdictions) where smoking was unrestricted. Others felt that the decision about smoking in their establishments was a business decision that was best left up to them, rather than one that required policy intervention. As the evidence on the health consequences of exposure to tobacco smoke amassed, arguments against smoke-free air policies became increasingly focused on their economic impact, rather than on the need to protect nonsmokers.

The tobacco industry has fueled this debate with its claims that smoke-free air policies will result in declining restaurant, bar, and other hospitality industry revenues; lost jobs in the hospitality sector; and business closings.[32,33] This was not a new strategy—the industry has long made and continues to make the same arguments about the dire economic consequences of other tobacco-control policies, most notably increased tobacco taxes and comprehensive bans on advertising, despite the growing evidence to the contrary.[34,35]

#### Studies Based on Objective Data

The spread of smoke-free air policies has provided numerous natural experiments that have allowed researchers to assess the economic impact of these policies on the hospitality industry, generally, and on restaurants, bars, casinos, and tourism, specifically. The best of these studies use objective data on outcomes such as sales tax revenues, employment, and the number of licensed establishments from the periods before and after the implementation of the policy, along with comparable data from other jurisdictions where there was no policy change as a control group. Given the volatility of the hospitality industry, inclusion of appropriate controls is critical to separating any effects of these policies from the economic and other factors that impact on business activity.

The first such study, by Glantz and Smith,[36] focused on the effects of local smoke-free restaurant ordinances adopted between 1985 and 1992 in 15 California and Colorado communities. The authors used multiple regression methods to look at taxable restaurant sales revenues as a share of total revenues before and after the implementation of smoke-free policies in these communities and in 15 comparable communities that did not have a smoke-free restaurant policy. The authors found no evidence that the ordinances had a negative economic impact on the restaurant business in communities that had banned smoking in restaurants. In a follow-up study,[37] the authors updated their analysis and also examined the impact of local smoke-free bar ordinances in 7 California localities that had also banned smoking in drinking establishments, using a comparable measure of revenues from businesses licensed to serve alcohol. Again, the authors found no significant economic impact of the local ordinances on either restaurants or bars.

Other studies have used measures of employment to assess the economic impact of smoke-free

policies. Hyland and Cummings,[38] for example, looked at employment in New York City restaurants before and after the adoption of the city's smoke-free restaurant ordinance in April 1995, comparing trends in the city to those in neighboring counties and the rest of the state. They found that between April 1993 and April 1997, there was an 18% rise in restaurant employment in New York City compared with a 5% increase in the rest of the state, leading them to conclude that the policy did not result in the job losses opponents had argued would occur. In a follow-up analysis, Hyland and Tuk[39] presented similar evidence of employment growth following the adoption of smoke-free restaurant policies in nearby counties (Nassau, Westchester, and Rockland). Similarly, Connolly and his colleagues[40] found that the Massachusetts smoke-free workplace law that went into effect in July 2004 and included restaurants and bars had no statistically significant impact on employment in food and drinking establishments. Likewise, in the heart of tobacco country, Pyles and his colleagues[41] found that employment in restaurants rose significantly while bar employment was unchanged following the implementation of Lexington-Fayette County Kentucky's comprehensive smoke-free policy in April 2004. In addition, they found no impact on employment in contiguous counties, contrary to opponents' arguments that the county ordinance would drive smokers to restaurants and bars in nearby jurisdictions where smoking was not restricted.

Still other studies have analyzed the impact of smoke-free policies on the number of licensed restaurants and/or bars. In their analysis of the New York City smoke-free restaurant policy, Hyland and Cummings,[38] for example, found that the rate of growth in restaurants in the city was equivalent to that in nearby counties and the rest of the state. Similarly, in their analysis of the Lexington-Fayette County ordinance, Pyles and his colleagues[41] found no effects on the overall rate of business openings and closings in the affected sector, as well as for both establishments licensed to serve alcohol and those that do not serve alcohol.

In 2 recent innovative studies, researchers looked at the impact of local smoke-free air policies on the economic value of restaurants[42] and bars[43] where economic value is determined by the sale price of these establishments. Alamar and Glantz found a median increase of 16% in the sale prices of restaurants covered by a smoke-free air restaurant policy, while finding no significant differences in the sale prices of bars subject to a smoke-free bar policy. Given this, the authors conclude that these policies increase the profitability of restaurants, while not adversely affecting the profitability of bars.

The impact of smoke-free air policies on tourism has been the subject of several studies over the past decade. Glantz and Charlesworth,[44] for example, looked at hotel revenues as a share of total retail sales revenues in 3 states and 6 cities that had adopted smoke-free restaurant policies. They concluded that there was no adverse impact on the hotel business in any jurisdiction studied, while finding a statistically significant increase in revenues in several of them. In addition, they looked at the impact of policies in California, Utah, and New York City on the number of international tourists visiting each, again finding either no impact of the policies or, in some cases, increases following the implementation of a smoke-free restaurant policy. Similarly, Hyland and his colleagues[45] looked at hotel revenues and employment in their analysis of the impact of local smoke-free policies in several New York state jurisdictions. Their multivariate analyses showed that both hotel revenues and employment rose in the year following the implementation of the policies. In a relatively comprehensive analysis of Florida's voter-approved smoke-free air law that went into effect in July 2003, Dai and his colleagues[46] examined a number of outcomes, including revenues from recreational admissions and employment in the hospitality industry, concluding that there was no adverse economic impact of the law on tourism in the state.

Relatively few studies have looked at the impact of smoke-free policies on gaming establishments given that most policies provide exceptions for smoking in these venues; nevertheless, a few studies provide some mixed evidence. Glantz and Wilson-Loots,[47] for example, looked at the impact of local smoke-free policies in Massachusetts that limit smoking in bingo halls and gambling events sponsored by local charities. While profits from these activities fell during the period covered by the analysis (given increased availability of other gambling opportunities), the authors found no

relationship between the local smoke-free policies and profits from bingo and charitable games. Similarly, Connolly and his colleagues[40] found no impact on Keno sales following the implementation of the statewide smoke-free air law in July 2004. However, 2 recent studies reach opposing conclusions concerning the impact of Delaware's comprehensive smoke-free air law that went into effect in November 2002 and included the state's 3 racetracks that offered video lottery gambling. In their linear regression analysis, Mandel and colleagues[48] found no impact of the state law on either total revenues from the video lottery machines or the average revenues per machine. After correcting a data entry error, the authors reaffirmed this conclusion in a subsequent letter.[49] In contrast, Pakko's[50] reanalysis of the same data using somewhat different methods and a more complete approach to modeling seasonality in gambling concludes that the state law led to an almost 13% drop in gaming revenues in the year following implementation compared with the previous year. In a response, Alamar and Glantz[51] note that the state attributed the observed decline in revenues to inclement weather, not the smoke-free air law, and that at least one of the racetracks was advertising its smoke-free environment, in contrast to what would be expected if the racetrack viewed this as harmful to its business.

To summarize, numerous studies using objective measures of economic activity have been done over the past 10+ years looking at the impact of local, state, or national smoke-free policies on restaurants, bars, and tourism. From small towns such as West Lake Hills, Texas,[52] to large cities like New York,[38,53,54] in states as diverse as Arkansas,[55] Oregon,[56] and Texas,[57] the vast majority of studies find that there is no negative economic impact of clean indoor air policies, with many finding that there may be some positive effects on local businesses (see Scollo and Lal[58] for a comprehensive review of studies published through mid-2005). While the early evidence is mixed on the impact on gaming establishments, the recent expansion of smoke-free policies to cover these venues will provide new natural experiments for researchers to examine.

#### Studies Based on Survey Data

In addition to the extensive studies based on objective data, a number of studies have used survey data to assess the economic impact of smoke-free air policies. These include surveys of restaurant and bar owners, as well as the patrons of these establishments. In general, these studies collect subjective data about owners' perceptions of the impact of smoke-free policies on their businesses, self-report measures of business revenues, individual dining and drinking-out patterns and/or expected changes in these behaviors in response to a smoke-free air policy, individual preferences for smoke-free dining/drinking, and related outcomes.

Studies based on subjective data from surveys of business owners and managers are more likely to produce mixed findings on the economic impact of smoke-free air policies than are studies based on objective measures of business activity. In their comprehensive review of studies published through August 2002, Scollo and her colleagues[59] estimated that the odds of finding a negative economic impact in studies based on this type of subjective data are 4 times greater than in studies based on objective measures. Glantz[60] provides some explanation for why this would be the case, arguing that there is a "negative placebo effect" created during the debate over smoke-free policies by the tobacco industry—often through restaurant, bar, and other hospitality industry associations stoking fears of economic losses among those in the hospitality industry. Similarly, it seems likely that owners of businesses that are faring poorly in a highly volatile market may be more likely to blame external forces (such as the adoption of a smoke-free policy) rather than their own business decisions for their problems.

Despite this, the findings from many of these studies are consistent with the conclusion that there is no negative economic impact of smoke-free air policies on the hospitality sector. Hyland and Cummings,[53] for example, surveyed 434 restaurant owners/managers in New York City in late 1996 as one component of their comprehensive assessment of the impact of the city's smoke-free restaurant policy adopted in 1995 and concluded from the survey that there was no evidence of a negative impact on New York City's restaurants.

Surveys that collect information on individual dining/drinking-out behavior and other entertainment activities are helpful in explaining the absence of any adverse economic impact (and, in many studies, a small positive impact) of smoke-free air

policies. The best of these surveys will use random samples of the general population rather than convenience samples of selected patrons from a nonrandom sample of establishments affected by the policies. In general, most respondents in population-based surveys indicate that their dining/drinking-out practices do not change following the adoption of a smoke-free policy. Among those who do indicate some change, the fraction who dine/drink out more frequently is well above that for those indicating that they go out less often. Cowling and Bond[61] hypothesized that this would be the case given that smokers have relatively few opportunities to substitute alternative venues when smoke-free policies are adopted. As a result, few smokers would alter their behavior in response to these policies, while these same policies would be more likely to attract more nonsmokers to the now smoke-free venues. This was the pattern observed by Hyland and Cummings[54] in their survey of New York City residents following the implementation of the city's 1995 smoke-free restaurant policy. The same happened after the expansion of the city's Smoke-Free Air Act in 2003. Zagat's 2004 New York City restaurant survey found that almost a quarter of respondents were dining out more often compared with 4% who indicated they dined out less often following the implementation of the city's comprehensive smoke-free workplace policy that covered all restaurants and bars.

#### Tobacco Industry-sponsored Research

Despite the strong and growing evidence to the contrary, the fear of economic consequences continues to deter many state and local governments from adopting strong, comprehensive smoke-free policies. Much of the "evidence" used to oppose these policies comes from studies that have been supported by tobacco companies or by groups that are supported by the tobacco industry. In their thorough analysis of this literature, Scollo and her colleagues[59] report that all of the studies concluding that smoke-free policies had a negative economic impact were supported by the tobacco industry and that the overwhelming majority (94%) of industry-sponsored studies reached this conclusion. They go on to note that in contrast with the research discussed above, these studies are much less likely to be published in the peer-reviewed literature, with the odds of a study not being peer-reviewed 20 times larger for studies that find a negative economic impact.

## SUMMARY

Clean indoor air laws creating completely smoke-free environments are rapidly spreading throughout the world and are low-cost, safe, and effective, many of the characteristics associated with rapidly diffusing innovations. Experience to date demonstrates that clean indoor air laws protect nonsmokers from involuntary exposure to secondhand smoke, contribute to a reduction in overall cigarette consumption, protect hospitality workers from adverse respiratory conditions, and are well accepted by the general public. Contrary to the fears raised by the tobacco industry and others, comprehensive reviews of research on the economic impact of smoke-free air policies from the Surgeon General,[3] the Task Force on Community Preventive Services,[24] and others[58,59] consistently conclude that these policies do not have a negative economic impact. The 2006 Surgeon General's Report, for example, states that "evidence from peer-reviewed studies shows that smoke-free policies and regulations do not have an adverse economic impact on the hospitality industry."[3]

It is likely that clean indoor air laws will continue to spread throughout the United States and around the globe, where smoke-free environments will be the norm and smoking in indoor public areas will be the rare exception. Future progress can be expected in creating smoke-free environments in homes, multifamily dwellings, cars in which children are riding, and outdoor public venues.



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# ALASKA SMOKE-FREE WORKPLACES

**EVERYONE HAS THE RIGHT TO BREATHE SMOKE-FREE AIR.**


## Statewide Supporters

- AARP
- Advanced Nurse Practitioners Association
- Agnew::Beck
- Akeela
- Alaska Association of Naturopathic Physicians
- Alaska Asthma Coalition
- Alaska Center for Resource Families
- Alaska Community Foundation
- Alaska Dental Association
- Alaska Federation of Natives
- Alaska Grown
- Alaska Native Tribal Health Consortium
- Alaska Native Health Board
- Alaska Native Veterans Association
- Alaska Nurses Association
- Alaska Nurse Practitioner Association
- Alaska Primary Care Association
- Alaska Public Health Association
- Alaska Sports Hall of Fame
- Alaska State Dental Hygienists Association
- Alaska State Hospital and Nursing Home Association (ASHNHA)
- Alaska State Medical Association
- Alaska Teen Media Institute
- Alaska Tobacco Control Alliance
- American Academy of Pediatrics – Alaska Chapter
- American Cancer Society
- American Diabetes Association Alaska
- American Heart Association
- American Lung Association
- Asthma and Allergy Foundation of America – Alaska Chapter
- Big Brothers Big Sisters of Alaska
- Doyon Limited
- Evangelical Lutheran Church of America – Alaska Synod
- March of Dimes
- Premera Blue Cross Blue Shield of Alaska
- RurAL CAP
- Volunteers of America – Alaska Chapter
- YWCA Alaska

## Anchorage Supporters

- Alaska Advanced Dentistry
- Alaska Bagel Restaurant
- Alaska Enterprise Solutions, Inc.
- Alaska Fresh Seafood & The Bubbly Mermaid
- Alaska Lens Rental
- Alpha Counseling and Education Services
- Anchorage Medical Society
- Anchorage Neighborhood Health Center
- Anchorage Pediatric Group
- Anchorage Senior Activity Center
- JC Rentals
- Kay's Family Restaurant
- Lawn Wizard Lawn Care
- Living Water Baptist Church
- Lone Star Steak House
- Michelsohn & Daughter Construction, Inc.
- Midnight Sun
- Mike's Maniacs Slow Pitch Softball
- Moose's Tooth Pub & Pizzeria
- Natural Pantry
- Obeidi Limited

- Anchorage School District
- Anchorage Youth Development Coalition
- Arctic Roadrunner
- Asthma, Allergy, and Immunology Center of Alaska
- Bear Paw Festival
- Bernie's Pharmacy, Inc.
- Catfish Haven Restaurant
- CCS Early Learning
- Chilkoot Charlie's
- Club Paris
- Diagnostic Health Anchorage
- Downtown Grill
- Flattop Pizza & Pool
- Graceworks Alaska
- Grandview Baptist Church
- Hotel Captain Cook
- Humpy's Great Alaskan Alehouse
- Identity Inc.
- Peanut Farm Bar and Grill
- Pro-Care Home Medical
- Pil's Deli
- Repairs Unlimited, LLC
- Sacks Cafe
- Seward's Folly Bar & Grill
- Side Street Espresso
- Smoke-Free Anchorage Coalition
- Snow City Cafe
- Snow Wizard Snow Plowing
- Spenard Roadhouse
- Starting Point, Inc.
- Sub Zero Bistro & Microlounge
- Terra Bella, Inc.
- The Flying Dutchman Pastry
- Tobacco Free Rainbow Alliance
- UAA Department of Health Science
- UAA Physical Education Department
- Uncle Joe's Pizzeria

## Gulf Coast Supporters

- A Balanced Approach - Kodiak
- Anchor Inn – Whittier
- Bases Loaded
- Crossroads Medical Center
- Emily's Alterations & Design - Kodiak
- Fishers Fuel Incorporated
- Glenn Transport LLC
- Hub of Alaska
- Images Hair and Tanning
- Island Air Service - Kodiak
- Kodiak Area Native Association
- Kodiak Island Borough School District
- Lake Louise Lodge
- Mill Bay Coffee & Pastries
- Northwoods Massage - Kodiak
- Orca Book and Sound
- Sparrows - Kodiak
- Stringbeadz by Susan - Kodiak
- Ton of Fun - Kodiak
- Tosina Lodge

## Interior Supporters

- Aframe Gas Station
- Alaska Acupuncture and Herb
- Alaska Grown
- Alaska Advanced Dentistry
- Alaska Universal Productions, Inc.
- Alpine Chiropractic and Massage
- Arctic Chiropractic
- Arctic Fire Hot Sauce – Fairbanks
- Arctic Lights Candle Company – Fairbanks
- Bettisworth North Architects
- Glennallen Chiropractic Clinic
- Granma's Quilt Shop
- Grassroots Guitar Co.
- Hatcher's Photography – Fairbanks
- Heartstream Yoga
- Husky Homestead
- Information Insights
- Jazzercise Fairbanks
- Kristi's Quisine
- Lale Louis Lodge

- Bonnie's Baskets & Things – Fairbanks
- Brewster's
- Castlerock Self Storage
- Connecting Ties
- Copper River Native Assocation
- Crossroad Medical Center
- Daniel M. Bergeron, DDS
- Denali ATV Adventures
- Denali Chamber of Commerce
- Denali Dome Home B&B
- Denali Jeep Excursions
- Denali Lakeview Inn
- Donna's House of Petals & Gifts
- doTERRA Essential Oils
- Duncan Designs – Fairbanks
- Eagle Tribal Buildings
- Elegant Memories
- Enchanted Forest Toys – Fairbanks
- Evans Industries
- Fairbanks Family Dental Care
- Fairbanks Memorial Hospital
- Finish Line – Fairbanks
- First Fruits Consulting – Fairbanks
- Food Factory – Fairbanks
- Frontier Farm
- GCI Fairbanks
- Geraldo's – Fairbanks
- Last Frontier Denali Photography
- Lavelle's Bistro
- McAfee Chiropractic – Fairbanks
- Minto Development Corporation
- Monderosa
- Nenana A Frame
- Nenana Native Village
- Nenana Urban Farm
- Persipicacity Contract Services
- Potter's – Fairbanks
- Railbelt Mental Health and Addictions
- Raven Retirement Community of Fairbanks
- Rose's Cafe
- Santa's Senior Center
- Shear Heaven Salon
- Sipping Streams Tea Company – Fairbanks
- Stanley Nissan
- Sue Cole Creations – Fairbanks
- Tanana Chiefs Conference
- Tartan Tundra Music
- Tri-Valley Fire Department
- Valley Chapel
- Warbelo's Air Adventures
- Wolfrun Restaurant – Fairbanks
- World Eskimo Indian Olympics
- White Palms Art Gallery
- Wright Air Service

## Kenai Peninsula Supporters

- ABC Pregnancy Care Center
- AK Sports, LLC
- Alaska Christian College
- Alaska Exports LLC
- Alaska Lanes
- Alaska Maxi Storage
- Alex Russell Pediatrics
- Bayan Asian Market
- Beemun's Variety
- Blazy Construction Inc.
- Bridges Community Resource Network
- Central Peninsula Hospital
- Chez Moi Boutique
- Chilson Computer Services
- McDonalds Restaurants of the Kenai Peninusla
- Michael P. Moriarty, PC, Seward
- Mykel's Restaurant
- Nancy Field Insurance
- Odie's Bead-It
- Orange Poppy
- Parker and Associates
- Peninsula Community Health Services
- Peninsula Dental Center
- Peninsula Medical Center
- Peninsula Powersports
- Peninsula Radio Group
- Pizza Boys, Inc.

- Chugachmuit
- Community Action Coalition
- Delta Leasing LLC
- Duck Inn
- Frontier Community Services
- Homer Head Start
- Hospice of the Central Peninsula
- Integrated Robotics Imaging Systems
- Jammin' Java
- Jeannie Annette Enterprises
- Kaladi Brothers Coffee
- Kenai Boys and Girls Club
- Kenai Peninsula School District
- Kenai Peninsula Youth Facility
- Kenai Public Health Center
- Kenda's Studio
- KPO Rehabilitation and Sports Medicine
- Linda Loris B&B, Seward
- Love, Inc. of the Kenai Peninsula
- Lucky 13 Fashions
- Professional Escrow Services Inc.
- Qutekcak Native Tribe
- Rez Fitness
- Seaview Cafe & Bar
- Seward Wellness for All Coalition
- Shiff RV & Boats
- Soldotna Mini Storage
- Soldotna Y Chevron
- SVT Health and Wellness
- Sweeney's Clothing
- Tammy's Flowers and Gifts
- The Daily Buzz
- The UPS Store #2752
- Tina's Hair Pros
- Trustee Services of Alaska Inc.
- Turnagain Heights, LLC
- Veronica's
- White Crane Academy
- Wilderness Way
- Winter's Grace Guidance Center

## Mat-Su Valley Supporters

- Alaska Center for Resource Families
- Alaska Family Services
- Alaska's Mat-Su Bed & Breakfast Association
- Alpha Counseling & Education Services
- Animal Food Warehouse
- Big Brothers Big Sisters of Mat-Su
- Board Media Group, LLC
- Braveheart Volunteers
- CAP Solutions, LLC
- Capstone Medical Clinic
- Chickaloon Village Traditional Council
- Choose Food Wisely, LLC
- Church of the Covenant
- Colony Inn
- Country Financial
- Crumb, LLC
- Ehman Outdoors
- Envision Mat-Su
- Family Promise Mat-Su
- Fence Emporium of Alaska, Inc.
- Fireside Books
- Mat-Su Convention & Visitors Bureau
- Mat-Su Education Association
- Mat-Su Health Foundation
- Mat-Su Housing & Homeless Coalition
- Mat-Su Health & Social Service Board
- Mat-Su Midwifery & Family Health
- Mat-Su Regional Medical Center
- Mat-Su Regional Medical Center Cardiac Rehab
- Mocha Me Crazy
- Murphy & Associates Engineering, LLC
- MY House / The Gathering Place
- Nonessentials, LLC
- North Star Animal Hospital
- OnMission Church
- Palmer Pentecostal Church
- Pioneer Peak Dental
- Pippel Insurance
- Rose Ridge Vacation Center
- Set-Free Alaska
- Sheep Mountain Lodge

- First Presbyterian Church of Wasilla
- Geneva Woods Pharmacy
- Greater Palmer Chamber of Commerce
- Hatcher Pass Bed & Breakfast
- Jenski Automotive
- Learning Essentials
- Mat-Su Borough School Board
- Mat-Su Conservation Services
- Stage 2 Studios, LLC
- Sunshine Community Health Center
- Thrive Mat-Su
- United Way of Mat-Su
- Unaccompanied Youth Task Force
- Valley Christian Conference
- Windbreak Cafe/Trouthouse Lounge

## Northern Alaska Supporters

- Airport Pizza - Nome
- Alaska Technical Center – Kotzebue
- Bering Air – Kotzebue
- Bearing Song & Gifts
- City of Kiana
- Era Alaska, Kotzebue
- Native Village of Kotzebue
- Native Village of Koyuk IRA Council
- Native Village of St. Michael
- Nome Radio Mission KNOM
- Noorvik Native Community
- Northern Inupiat Housing Authority
- Ryan Air
- Savoonga Native Store
- Sitnasuak Native Corporation
- Village of Nome IRA Council
- Village of Solomon

## Southeast Alaska Supporters

- Adventure Kits – Ketchikan
- Aimee Shull Photography - Ketchikan
- Alaska Arts Southeast
- Alaska Grafix – Juneau
- Alaska Island Community Services
- Alaska Laundry and Drycleaning – Juneau
- Alaska Native Girls – Metlakatla
- Alaska Native Sisterhood Camp #16
- Alaska Rainforest Sanctuary – Ketchikan
- Aquatic Alaska Adventures
- At the White House B&B – Skagway
- Aurora Chiropractic Center
- AWARE Inc. – Juneau
- Bev's Flowers and Gifts
- Braveheart Volunteers
- Breakaway Adventures – Wrangell
- Brenner's Fine Clothing and Gifts
- Catholic Charities
- Chilkoot Indian Association
- Creek Street Historic Properties – Ketchikan
- Creekside Family Health Clinic – Ketchikan
- Organized Village of Kasaan
- National Council on Alcohol and Drug Dependence (NCADD- Juneau)
- Natural Healthcare – Juneau
- North to Alaska
- Northern Lights United Church – Juneau
- Northstar Television Network
- Northwind Architects – Juneau
- Paper Pirates – Ketchikan
- Peace Health Ketchikan Medical Center
- Petersburg Indian Association
- Petersburg Mental Health Services
- Petersburg School District
- Radioshack – Ketchikan
- Rainforest Crafts - Ketchikan
- Rainbow Foods – Juneau
- Rainforest Naturalpathic Medicine
- Red Onion Saloon
- Rob Cohen Music – Juneau
- Robertson's Gallery & Custom Framing
- Rodfather's Broiler Restaurant

- Diamond C Cafe – Wrangell
- Diversified Investments & Insurance – Ketchikan
- Douglas Weaver, DDS – Juneau
- Frontier Shipping & Copyworks - Ketchikan
- Garnet School - Juneau
- Gateway Center for Human Services - Ketchikan
- Goldbelt Inc. – Juneau
- Heritage Coffee
- Heritage Northwest Inc. - Juneau
- Hoonah Indian Association
- Hoonah Liquor Store
- Icy Straits Lodge
- Ike's Fuel
- Inn at Creek Street – Ketchikan
- Inside Passage Midwifery & Natural Medicine
- Jerry's Books and Games – Ketchikan
- Juneau Arts & Humanities Council
- Juneau Family Health and Birth Center
- KACN-TV
- Ketchikan Public Health
- Ketchikan Ready Mix Inc.
- Ketchikan Youth Court
- Knockout Productions – Juneau
- Lifetime Eye Care
- Love in Action – Ketchikan
- McDonald's of Southeast Alaska
- Sitka Tribe of Alaska
- Sitkans Against Family Violence
- Skagway Brewing Company
- Southeast Alaska Guidance Association (SAGA)
- Southeast Alaska Regional Health Consortium (SEARHC)
- Southeast Furniture Warehouse
- Southeast Medical Clinic
- Starboard Frames and Gifts - Ketchikan
- State Farm Insurance in Ketchikan
- Stereo North Inc.
- Stikine Drug – Wrangell
- Sylvan Enterprises
- Taquan Air – Ketchikan
- The Fox Hole - Ketchikan
- The Office Bar – Hoonah
- The Wild Oven Bakehouse – Juneau
- Tongass Mobile Estates – Hoonah
- Tideland Tackle & Marine – Hoonah
- University of Alaska Southeast, Sitka Campus
- Urban Eskimo – Juneau
- Videl Entertainment
- Wellspring Inc. Integrative Medicine
- Wostmann & Associates Inc.
- Wrangell Public Health Center
- Wrangell School District
- Yoga Union Inc.

## Southwest Alaska Supporters

- 4th and Broadway Boutique
- Aleutian Pribilof Island Association
- ArXotica Inc
- Bethel Chamber of Commerce
- Bethel Family Clinic
- Bristol Bay Area Health Corporation
- Donlin Gold
- Marilyn's Hair Salon
- Portraits by Piper
- Pribilof School District
- Unalaskans Against Sexual Assault and Family Violence (USAFV)
- Yukon-Kuskokwim Health Corporation

January, 2013

Green = Comprehensive smoke-free workplaces ordinances in place

Yellow = Sitka has an exemption for bars in stand-alone buildings, but all other workplaces are covered

Orange = Boroughs without the authority to pass smoke-free workplace ordinances on the local level due to lack of health powers

Gray = Legal analysis not conducted, but likely in the same category as the orange-shaded boroughs with inadequate health powers to enact smoke-free

| Borough | Borough seat | Class | Population | Area | Map |
|---|---|---|---|---|---|
| Aleutians East Borough | Sand Point | Second | 3,141 | 6,988 sq mi (18,099 km$^2$) |  |
| Anchorage | (*Consolidated city-borough*) | Unified Home Rule | 291,826 | 1,697 sq mi (4,395 km$^2$) |  |
| Bristol Bay Borough | Naknek | Second | 997 | 505 sq mi (1,308 km$^2$) |  |
| Denali Borough | Healy | Home Rule | 1,826 | 12,750 sq mi (33,022 km$^2$) |  |
| Fairbanks North Star Borough | Fairbanks | Second | 97,581 | 7,366 sq mi (19,078 km$^2$) |  |
| Haines Borough | (*Consolidated city-borough*) | Home Rule | 2,508 | 2,344 sq mi (6,071 km$^2$) |  |
| Juneau | (*Consolidated city-borough*) | Unified Home Rule | 31,275 | 2,716 sq mi (7,034 km$^2$) |  |

January, 2013

| Borough | Borough seat | Class | Population | Area | Map |
|---|---|---|---|---|---|
| Kenai Peninsula Borough | Soldotna | Second | 55,400 | 16,013 sq mi (41,473 km$^2$) |  |
| Ketchikan Gateway Borough | Ketchikan | Second | 13,477 | 4,840 sq mi (12,536 km$^2$) |  |
| Kodiak Island Borough | Kodiak | Second | 13,592 | 6,560 sq mi (16,990 km$^2$) |  |
| Lake and Peninsula Borough | King Salmon | Home Rule | 1,631 | 23,782 sq mi (61,595 km$^2$) |  |
| Matanuska-Susitna Borough | Palmer | Second | 88,995 | 24,682 sq mi (63,926 km$^2$) |  |
| North Slope Borough | Barrow | Home Rule | 9,430 | 88,817 sq mi (230,035 km$^2$) |  |
| Northwest Arctic Borough | Kotzebue | Home Rule | 7,523 | 35,898 sq mi (92,975 km$^2$) |  |
| Sitka | (*Consolidated city-borough*) | Unified Home Rule | 8,881 | 2,874 sq mi (7,444 km$^2$) |  |
| Skagway | - | First | 968 | 452 sq mi (1,171 km$^2$) |  |

| Borough | Borough seat | Class | Population | Area | Map |
|---|---|---|---|---|---|
| Unorganized Borough | - | - | 78,149 | 323,440 sq mi (837,706 km²) |  |
| Wrangell | (*Consolidated city-borough*) | Unified Home Rule | 2,369 | 2,570 sq mi (6,656 km²) |  |
| Yakutat | (*Consolidated city-borough*) | Home Rule | 662 | 7,650 sq mi (19,813 km²) |  |

# Saving Lives, Saving Money

A **state-by-state** report on the health and economic impact of comprehensive **smoke-free laws**

2011

Cancer Action Network℠
American Cancer Society®

**acscan.org**

# Executive Summary

Each year, tobacco use causes hundreds of thousands of premature deaths and costs billions of dollars in medical care and productivity losses in the United States. Strong tobacco control policies at the state level can help reduce the burden of tobacco use. *Saving Lives, Saving Money: A State-By-State Report on the Health and Economic Benefits of Comprehensive Smoke-Free Laws*, provides new information about the public health and economic benefits to states that implement smoke-free laws.

Comprehensive smoke-free laws reduce exposure to secondhand smoke, encourage people to quit or cut down on smoking, and prevent youth from starting to smoke. As these laws reduce smoking and secondhand smoke exposure, data show that they reduce disease and heath care spending, and they improve employee productivity.

The American Cancer Society Cancer Action Network (ACS CAN) commissioned leading experts to derive updated and expanded estimates for the public health benefits and economic savings in the 27 states that currently do not have a comprehensive smoke-free law in place.

The estimates show that in each of these states, a smoke-free law would result in fewer smokers, fewer smoking-related deaths, and fewer youth who become smokers. In addition, a comprehensive smoke-free law in each state would substantially reduce health care costs associated with several smoking-related diseases.

## *SAVING LIVES*

The data show that comprehensive smoke-free laws would decrease the number of adult smokers by tens of thousands in many states. North Carolina, for example, would have 78,100 fewer adult smokers by adopting a comprehensive law that closed the current loophole that allows smoking in non-hospitality workplaces. The results also show that nearly 400,000 fewer young people would become smokers if states without a comprehensive smoke-free law adopted one, further reducing the health and economic burden of smoking. The reduction in smoking-related deaths avoided by implementing smoke-free laws ranges from several hundred in states with smaller populations to more than 110,000 in Texas. Non-smokers' deaths would be prevented in every state that applies a smoke-free law. If each of the 27 states without a comprehensive smoke-free law had such a law in place, the following estimates of public health benefits would apply:

| Adults Who Would Quit Smoking | Youth Who Would Never Start Smoking | Reduction in Smoking-Related Deaths | Reduction in Deaths of Non-smokers |
|---|---|---|---|
| 1.03M | 398,700 | 624,000 | 69,500 |

## *SAVING MONEY*

The total estimated savings in health care costs from adopting comprehensive smoke-free laws adds up to tens or hundreds of millions of dollars in most states. Seven states would each save at least $80 million in spending on lung cancer, heart attacks and strokes, and pregnancy complications over five years. All together, the 27 states without a comprehensive smoke-free law currently in place could save an estimated $1.32 billion in treatment of those conditions over five years.

| Lung Cancer Treatment Savings | Heart Attack and Stroke Treatment Savings | States' Medicaid Program Savings | Smoking-Related Pregnancy Treatment Savings |
|---|---|---|---|
| $316.11M | $875.57M | $42.79M | $128.26M |

*Figures represent savings for both smokers and non-smokers.*

## *WHAT STATES CAN DO*

There is still much work to be done – 27 states have no statewide smoke-free law in effect or have a law that does not cover all workplaces or populations. Hospitality and casino workers, who studies show are exposed to dangerous secondhand smoke on the job, continue to be denied their right to breathe smoke-free air in a large number of states. Opponents of smoke-free legislation continually battle to weaken existing laws through loopholes and exemptions, further complicating efforts to achieve the benefits of these laws. States in which some residents are covered by city or county smoke-free laws would see greater health and economic outcomes if a strong, comprehensive statewide law were implemented.

ACS CAN recommends that all states aim for statewide laws that are comprehensive and protect all workers from the dangers of secondhand smoke.

- Smoke-free laws should cover **all workplaces**.
- Venues should be **100 percent smoke-free with no exceptions**, such as allowing smoking in certain places or at certain times.
- Statewide smoke-free laws should **not preempt local authorities** from enacting stronger smoke-free laws in their jurisdictions.

# Alaska Smoke-Free Indoor Workplaces

**Only half of Alaska's population is covered by a current smoke-free workplace law. A statewide smoke-free indoor workplaces law would update existing Alaska state law to provide comprehensive protection from secondhand smoke for employees and customers in all enclosed workplaces and places of public accommodation.**

**This law would prohibit smoking in all indoor workplaces, businesses and public spaces. It would require that those who choose to smoke "take it outside" in order to better protect the health and safety of all workers, patrons and visitors from the disease and premature death caused by secondhand smoke. No one should have to choose between their health and a good job. Due to limitations in local authority, it is time for a statewide law.**

**A statewide law would create a standard with regard to secondhand smoke that puts all businesses and workplaces across Alaska on a level playing field.**

## Everyone has the right to breathe smoke-free air.

### Smoke-Free Laws Save Lives

There is conclusive scientific evidence that secondhand smoke causes heart disease.

- Studies of at least 10 communities published in peer-reviewed journals have proven a decrease in heart attack incidence after the implementation of smoke-free laws.[2]
- Helena, MT enjoyed a 40% decrease in heart attacks among Helena residents while smoke-free laws were in place.[2]
- Heart attack hospitalizations fell by 41% in Pueblo, CO after a comprehensive smoke-free law was enacted. This decrease was sustained over a three-year-period.[2]

## Anchorage Experiences

### Smoke-Free Laws Benefit Businesses

Using employment data on Anchorage bars from 2001 to 2010, a report commissioned by the Alaska Department of Health and Social Services Tobacco Prevention and Control Program (2011) found:

Bar employment within the Municipality was 10% higher than it would have been if the smoke-free law had not been implemented.

The Institute of Social and Economic Research interviewed representatives of 50 full-service restaurants and bars in Anchorage on their perceptions of the impact of the smoke free indoor ordinance.

- 76% of restaurant and bars reported very positive or somewhat positive feedback from customers and employees.
- A total of 96% (48/50) of surveyed full-service restaurant and bar representatives identified at least one benefit from the passage of the smoke-free ordinances in Anchorage.
- Most respondents identified a cleaner environment, increased customer and employee satisfaction, improved employee health, more new customers, and lower maintenance costs as benefits of a smoke-free Anchorage.

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American Heart Association | American Stroke Association.

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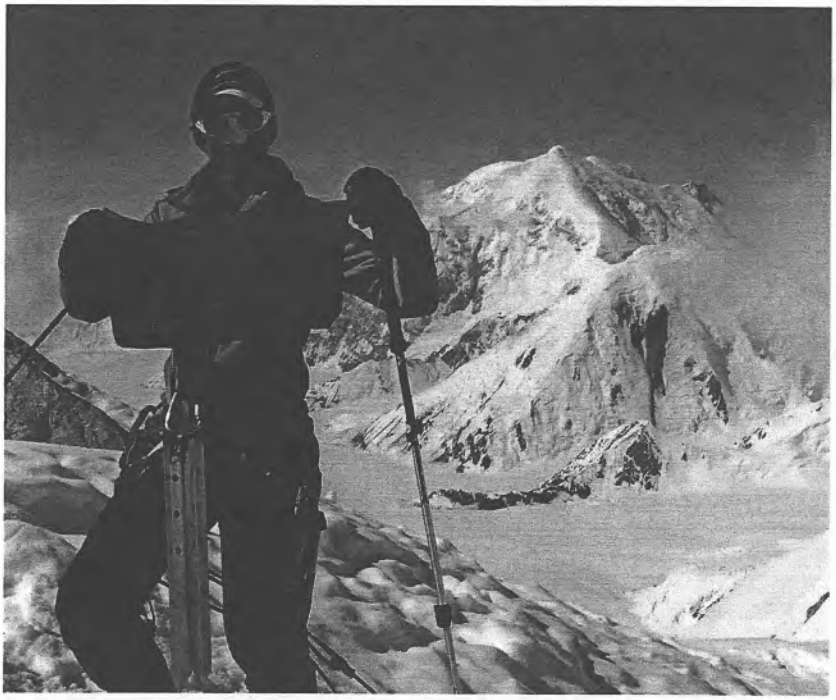
ALASKA NATIVE HEALTH BOARD

## Alaskans strongly support smoke-free indoor workplaces.

- 4 in 5 Alaska adults support smoke-free workplaces.[4]
- Support for smoke-free indoor workplaces includes a strong majority of current smokers (59%) as well as former smokers (80%).[4]
- Alaskan support for smoke-free indoor workplaces is high throughout all regions of the state, ranging from 75% to 84%.[4]



## The Need for Legislation

- Secondhand smoke is a major cause of needless, preventable death, causing or worsening a wide range of adverse health effects, including lung cancer, heart disease, respiratory infections, and asthma. Most significantly, it has been shown that even brief exposure can be dangerous.[1]
- Non-smokers exposed to secondhand smoke increase their risk of heart disease and lung cancer by up to 30 percent.[1]
- The U.S. Surgeon General's Report, "The Health Consequences of Involuntary Exposure to Tobacco Smoke," (2006) concluded that there is no risk-free level of exposure to secondhand smoke; ventilation and other air cleaning technologies cannot eliminate exposure of nonsmokers to secondhand smoke; and that comprehensive smoke-free workplace policies are the only effective way to eliminate secondhand smoke exposure in the workplace[1]
- Published research in communities before and after adoption of comprehensive smoke-free workplace laws has documented a significant decline in heart disease-related hospital admissions.[2]

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**From:** Sarah Ballesteros <srballesteros10@gmail.com>
**Sent:** Sunday, March 23, 2014 8:38 AM
**To:** Julie Morris
**Subject:** HB360

Hello Ms. Morris,

My name is Sarah Ballesteros. I was a longtime smoker and after countless attempts at quitting I finally found something that is healthy and MORE enjoyable than smoking. I vape. I do not miss cigarettes whatsoever. My health has improved and I no longer feel the guilt and shame that I had when I was a smoker.

I oppose electronic cigarettes being added to HB360 because, studies have shown that the particles that's emitted when vaping is similar to those from human breath. Please read the following study at: http://www.biomedcentral.com/1471-2458/14/18/abstract)

Thank you for your time and consideration,

Sarah Ballesteros

**Julie Morris**

| | |
|---|---|
| **From:** | derrick mells <derrick.mells@gmail.com> |
| **Sent:** | Sunday, March 23, 2014 1:03 PM |
| **To:** | Rep. Pete Higgins; Rep. Wes Keller; Rep. Benjamin Nageak; Rep. Lance Pruitt; Rep. Lora Reinbold; Rep. Paul Seaton; Rep. Geran Tarr; Julie Morris |
| **Subject:** | HB 360, please vote no! |

Hello,

I just read HB 360 and would encourage you to vote no or amend the bill to not include E-cigarettes in the definition of smoking. I am a resident of Alaska and this issue is important to me, I will attempt to keep this brief as I know how valuable all your time is. Below are few of my reasons, feel free to contact me if you have any questions or would like sources to claims.

1. I would not have been able to quit smoking without E-cigarettes, they are a safe, cheap and effective way to quite smoking real cigarettes.
2. The main reason to ban smoking indoors is negative impact on health and nuisance of smell. E-Cigarettes have neither of this.
3. No harmful chemicals have been found is second hand "e-smoke" and the smell does not linger for more than a few seconds. There is also the option of using them so that no "smoke" is visible.
4. Its not very republican or Alaskan to put small business owners at risk. Banning E-cigarettes indoors would put many of the E-cigarette or "vapor lounges" out of business. being able to test a product is an absolute to being able to sell it.
5. It is not very republican or Alaskan to further regulation and to take the right to choose out of the hands of business owners. Places should have the right to choose to allow or disallow the use of E-cigarettes indoors.
6. Banning REAL cigarettes indoors but not further regulating E-cigarettes would show smokers that their is an effective and safe alternative to smoking. Banning E-cigarettes would not help people quit.

Thank you for listening to me and again feel free to contact me if you have any questions about E-cigarettes, their use, terminology or anything else.

Derrick W. Mells
907-978-6980
Registered Voter and life long Alaskan resident

**Julie Morris**

**Subject:** FW: House Bill NO. 360

**From:** Mickey Edelen [mailto:michelleedelen@live.com]
**Sent:** Friday, March 21, 2014 8:02 PM
**To:** Rep. Pete Higgins; Rep. Wes Keller; Rep. Benjamin Nageak; Rep. Lance Pruitt; Rep. Lora Reinbold; Rep. Paul Seaton; Rep. Geran Tarr; Julie Morris
**Subject:** House Bill NO. 360

Good evening,

My name is Michelle Edelen I was born in Southeast Alaska and currently I live in Wasilla, Alaska. I am writing to give my experience with e-cigarettes.

First off I agree with not selling tobacco to minors.

It is known that, "there are 600 ingredients in a cigarette and when burned there is more than 4,000 chemicals." (http://www.lung.org/stop-smoking/about-smoking/facts-figures/whats-in-a-cigarette.html)

"An e-cigarette has various components. The mouthpiece, the atomizer, an the battery. The mouthpiece can be or is connected to a container which holds the e-liquid or e-juice. The ingredients are flavor (which is food grade), nicotine dissolved in propylene glycol and/or vegetable glycerin", (http://www.medicalnewstoday.com/articles/216550.php)

Propylene glycol can be found in MiO water enhancers, fog machines, and in Asthma inhalers.

Nicotine can be found in tomatoes, potatoes, and cauliflower

Vegetable glycerin is sugar alcohol used in pharmaceutical formulations and a thickener in culinary fields.

Many people confuse vaping with smoking. When a person smokes a cigarette the smoke raises and is warm and there are thousands of chemicals that can be passed to others that are close. When a person vapes it is cool

and drops and the vapor contains some nicotine (which is found in foods) but no other chemicals that are typically found in cigarette smoke.

Before vaping, I smoked for 20 to 25 years. I have tried Nicorette, the patches, and Chantix with no success. I have been vaping for a month now and have not picked up a cigarette. I feel better, and I have actually stopped smoking.

After reading the House Bill NO. 360, I believe that e-cigarettes should not be classified with smoking a tobacco cigarette and should not be included in this bill. I believe if including e-cigarettes to this bill will prevent a healthy alternative to smoking a tobacco product which is known to cause harm not only to the smoker but to any by-standers.

Thank you for your time,

Michelle Edelen

**Julie Morris**

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**From:** Wire Smith <mrncasler@gmail.com>
**Sent:** Monday, March 24, 2014 6:45 AM
**To:** Julie Morris
**Subject:** E-Cig testimonial

Julie,

I am writing you on behalf of myself, and all users of electronic cigarettes in Alaska. I have read through the propaganda piece you were handed, and am appalled. Please take the time and effort to study the current state of the art on e-cig technology and supplies, as well as the actual health effects of this lifesaving technology.

My personal experience was actually fairly typical. I was a pack-a-day smoker for 15 years, and I began using gas station or entry level e-cigarettes to allow me to handle longer car rides with my father, who is suffering from COPD as a result of lifetime smoking. Over time, I found juices that offered flavors compelling enough, and hardware reliable enough, that it was preferable to smoking. That was pretty much the end of my habit. I recently had to sprint about a hundred yards to rescue a co-worker (who turned out not to be in harm's way), and while I was smoking this effort would have left me completely exhausted, if I was able to perform it. At this point, I was able to make the run, and even though my heart was pounding and I was breathing heavily, I was still able to function.

I beg you, take a closer look at the facts and data around e-cig use. This is a lifesaving technology that could allow millions of smokers the chance to live longer, healthier lives. The fact that my bedroom smells faintly of bananas instead of strongly of an ashtray is just icing on the cake.

Thank you for your time,
Nick Casler

**Julie Morris**

**Subject:** FW: HB360

**Importance:** High

**From:** cameronalaska@gmail.com [mailto:cameronalaska@gmail.com]
**Sent:** Saturday, March 22, 2014 12:34 AM
**To:** Rep. Pete Higgins; Rep. Wes Keller; Rep. Benjamin Nageak; Rep. Lance Pruitt; Rep. Lora Reinbold; Rep. Paul Seaton; Rep. Geran Tarr; Julie Morris
**Subject:** HB360
**Importance:** High

I would like to make clear my opinion on the HB360 which is being proposed to ban e-cigs.

I am turning 35 this year. I started smoking in the air force at age 16.

4 years ago my wife found what I consider to be a God send when she smoked her first E-cig. She have never again had a normal cigarette again nor did I, 2 years later after seeing how successful she had been making the switch.I too made the switch and never looked back We are becoming healthier.

I had tried before to quit smoking and failed, even called the state help line and was given patches and such. Which not only didn't help, but I smoked while wearing the patch.

We no longer have to worry about the other 5000 chemicals in normal cigarettes made by the big tobacco industries, which is where the real danger is.

The vapor is really no different than the vapor ( or fog) machines used at concerts.

People have pushed smokers really far to give up cigarettes because of second-hand smoke. Which we had tried To comply with. Now that we have found an alternative that puts no one at risk, that too is being attacked?

This sounds more like a control issue instead of the health issue which was claimed with normal cigarettes. In a day and age when so many states are thinking or making Marijuana legal, isn't it a step backwards to Outlaw e-cigs?

Yet look how many drunks kill or injure people every year, yet alcohol is still legal. My e-cig hurts no one, And as an adult USA citizen it should be my choice what I put in my body.

If e-cigs are made illegal we will all end up going back to normal cigarettes, which really are harmful.
I know that would make the big tobacco companies happy, but if a healthier America is what you are striving for,
Than don't make the huge mistake of outlawing e-cigs, which are contributing to the goal of a healthier America. To do so would just create a black market for them.

I realize that people are afraid of that which they don't know, which seems to be the case here.
But so far it has been proven they are a much much safer alternative, and outlawing them would be

Taking 20 step backward to what the goal is for a healthier America. Not to mention it would absolutely Cause all who have changed over to them to go right back to the unhealthy analog Cigarettes.

I really don't think you can say they are worse than alcohol, yet alcohol remains legal for those 21 and over, Just as these should. Please help keep America free,
And stand up for my rights also, as you were voted to do so.

I am a registered voter. Thank you for your time,

Cameron Hughes
3901 Hayes ST
Anchorage, AK. 99503
907-929-2254

**Julie Morris**

**Subject:** FW: HB360

**From:** dhsaber@inbox.com [mailto:dhsaber@inbox.com]
**Sent:** Saturday, March 22, 2014 12:01 AM
**To:** Julie Morris
**Subject:** HB360

I would like to make clear my opinion on the HB360 which is being proposed to ban e-cigs.

I am turning 48 this year. I started smoking in the air force at age 17.

4 years ago I found what I consider to be a God send when I smoked my first
E-cig. I have never again had a normal cigarette. My body is becoming healthier, and for someone like me who is disabled and had Hepatitis C, this is important.

I had tried before to quit smoking, and even called the state help line and was given patches and such. However I am allergic to adhesives, and the other quit nicotine devices just did not work. The patches that I did try even though they made my skin itch also did not work.

After watching me for two years my husband too has been able to successfully transfer over to e-cigs. We no longer have to worry about the other 5000 chemicals in normal cigarettes made by the big tobacco industries.

Last year my mother had a heart attack in Texas and died 3 times, before I could make it there. When I did get there she was in ICU on life support, and I sat beside her bed and was allowed in ICU to use my e-cig. Which she now since her recovery as switched to.

My local doctor even tried my e-cig and was very impressed, along with the pharmacist which admitted to me he tells all his friends.
E-cigs have been a life saver. There is no doubt in my mind that without them I'd still have my 2 pack a day habit.
There is no secondhand smoke to worry about, as it's vapor not smoke which if I choose I can make no escape my mouth, so people don't even see it.

The vapor is really no different than the smoke ( or fog) machines used at concerts.

People have pushed smoker really far to give up cigarettes because of secondhand smoke. Which we have tried to comply with. Now that we have found an alternative that puts no one at risk, that too is being attacked?

This sounds more like a control issue instead of a health issue which was claimed with normal cigarettes. In a day and age when so many states are thinking or making Marijuana legal, isn't it a step backwards to outlaw e-cigs?

Yet look how many drunks kill or injure people every year, yet alcohol is still legal. My e-cig hurts no one, and as an adult USA citizen it should be my choice what I put in my body.

If e-cigs are made illegal we will all end up going back to normal cigarettes, which really are harmful. I know that would make the big tobacco companies happy, but if a healthier America is what you are striving for, than don't make the huge mistake of outlawing e-cigs, which are contributing to the goal of a healthier America. To do so would just create a black market for them.

I realize that people are afraid of that which they don't know, which seems to be the case here. But so far it has been proven they are a much much safer alternative, and outlawing them would be taking 20 step backward to what the goal is for a healthier America. Not to mention it would absolutely cause all who have changed over to them to go right back to the unhealthy analog Cigarettes.

I really don't think you can say they are worse than alcohol, yet alcohol remains legal for those 21 and over, just as these should. Please help keep America free,
And stand up for my rights also, as you were voted to do so.

I am a registered voter. Thank you for your time,

Deidre Holladay-Hughes
3901 Hayes ST
Anchorage, AK. 99503
907-929-2254

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**Julie Morris**

| | |
|---|---|
| **From:** | Gv <glaciervapors@gmail.com> |
| **Sent:** | Saturday, March 22, 2014 1:22 PM |
| **To:** | Rep. Pete Higgins; Rep. Wes Keller; Rep. Benjamin Nageak; Rep. Lance Pruitt; Rep. Lora Reinbold; Rep. Paul Seaton; Rep. Geran Tarr; Julie Morris |
| **Subject:** | HB360 |

I am writing to you today to ask you to reconsider HB360. There are several flaws with this bill, but the biggest flaw is grouping electronic cigarettes in with this smoking ban.
The information that was passed out to each of you is full of mis-information, or half truths. I know that your time is very valuable and sometimes it's not easy to do your own research and sometimes it's just easier to take everything at face value. So, I have a couple of links that I would like for you to consider. I have many many many more if you would like them.

This study, done in 2012 shows that in fact, the vapor emitted by electronic cigarettes is, in fact, far far safer than traditional tobacco cigarettes.

http://clearstream.flavourart.it/site/wp-content/uploads/2012/09/CSA_ItaEng.pdf

This study was released in January of 2013. By Drexel Univeristy.
Here is this abstract:
http://www.biomedcentral.com/1471-2458/14/18/abstract

Here is the complete study:
http://publichealth.drexel.edu/~/media/Files/publichealth/ms08.pdf

Electronic cigarettes offer those of us that have smoked for years and tried to quit for each of those years a way out. A way out without the harmful side effects of pharmaceuticals and nicotine replacement therapies that don't work. All of which I have tried. I believe in electronic cigarettes so much that we cashed out our retirement, and opened a vape only store. This June will be our one year anniversary. I have watched people walk away from traditional cigarettes for good using electronic cigarettes.
Electronic cigarettes offer options to those that chose to use them. It's up to each individual to chose the battery, the tank system, the flavor of e-liquid, the nicotine strength. In our store, we have watched people drop down their nicotine levels to 0 and eventually stop vaping all together. They do this without going back to cigarettes. We celebrate every customer that does this. It's very liberating for the individual and very rewarding for us as a business owner. It seems backwards, but it's true.
The reason electronic cigarettes work is BECAUSE of the options. Most reputable vape shops are set up so that customer can try the products before they buy them. Taste is subjective. What one person likes another one will not. Finding a delivery system and flavors that you like are key to being successful in the journey to escape the tobacco addiction. If this bill is passed, the options can not be explored by those wanting to get away from cigarettes. This bill will literally put most shops out of business. How can we customize each electronic cigarette for each individual if they are not allowed to try it in store?
My store made a profit in January and February and it's looking like March will continue the trend. This means that our business will pay taxes on those profits. I have no problem doing that. But if my store is forced to close because of a state wide smoking ban that includes electronic cigarettes, I will have a problem in NOT paying future taxes on profits that are not there because of a forced closure.
I truly believe that it should remain up to businesses whether they allowing smoking or vaping in their establishment.
Thank your for your time.

Angela Carroll
Owner of Glacier Vapors
Palmer Alaska

Sent from my iPad

**Julie Morris**

**Subject:** FW: E-Cigs: A TRUTH

**From:** Angelina Roskam [mailto:angelina.roskam@hotmail.com]
**Sent:** Saturday, March 22, 2014 5:33 AM
**To:** Julie Morris
**Subject:** E-Cigs: A TRUTH

To Ms. Julie Morris,

Please, hear me out on this- I understand the fear in many, over something they may believe will cause more harm than good. But I can not understand why these respected individuals fail to see the amount of good and positive behind the alternative to straight tobacco filled cigarettes, emitting constant toxins to not only those who smoke, but innocent bystanders.

Coming from a former cigarette smoker: vapor e-cigs have saved my life. I went from a pack (sometimes more) a day, inhaling toxins AND emitting them to others around me, to being introduced to e-cigs and VAPOR- the *healthier* alternative to help aide in quitting.

Vapor has changed my life. Instead of having to go through the chewing gum constantly, or wearing a patch that doesn't stay put through daily activities- I was introduced to a more reasonable way to wean me from the grips of nicotine. That blessing has not only saved my life, but for once in over 5 years- I am able to *breathe* again, I can run or swim without coughing or wheezing! I am not having to cut time out of my work day to smoke a cigarette away from the general population (which gags most). I am not having to in ANY way modify my life anymore, to the grips of cigarettes.

Because, the **BEST** thing that ever happened to my quitting process- vapor. Let me explain why:
1. I could CHOOOSE the nicotine level! (Start with what I was accustomed to, and work down each week, etc... to **0mg!** )
2. There are NO toxins! What you have is a small amount of sugars & molasses- some artificial flavor, and ONLY nicotine! Absolutely no arsenic, charcoal, etc... *HARMFUL* chemical agents found in cigarettes.
3. VAPOR. Key word. There is **0** smoke!!! No one is harmed from vapor. Standing by= NO toxins!

Society, these days, is too focused on "taboo". Smoking is absolutely one of them. What so many fail to understand, are how these vapor alternatives are actually helping SO many quit, and also improving the environment in more than one way. For starters- there are less toxins in the air. Not to mention, that improves the air quality overall, along with eliminating second hand smoke from a handful of those who would otherwise still be smoking classic cigarettes. Medical bills go down, because there is less cancer and other harmful medical conditions related to smoking. Speaking up front- my blood pressure has come back down to a normal level (with my doctor congratulating me) on switching to vapor! My family members applaud me for quitting what made them sick to see and smell. My employer applauds me for not walking in smelling like an ashtray and not having to take the allotted 15 minute breaks twice a day. I am not taking up space in a hospital room or emergency room being treated for chemical ailments that were otherwise killing me and wasting the time of patients who did not choose their disease.

Please, before you are SO quick to ban something that has saved SO many lives, already, without taking the

time to REALLY see the inside outlook of those of us who use it for the **RIGHT** reasons, just consider this: You have a 13-17 year old young adult at home. They become curious and find a pack of cigarettes, but also find an e-cig (or vaporizer)... WHICH would you rather them try? The one that is filled with chemicals, toxins and everything addictive/destroying... or would you rather them try a **much** less harmful vapor, containing 18mg or LESS (down to **0**) of only nicotine, which is proven to be the lesser of two evils in traditional cigarettes? If I were a parent, YES, I absolutely would educate my child, but I also was once in those years, and I would have **much** rather tried an e-cig than gotten addicted to what has sucked SO much of my health, life and pay away.

I have wanted to quit for years. Everyone who tries the patch or gum... never works. Everyone who seems to go on the pharmaceuticals seems to get angry & violent. I don't want the failure or side effects. I want to be able to say I switched to something healthier to aide me in quitting for good. E-cigs and vapor has done that for me. I am grateful. And not only that- I have a community of others, just like AA, that understand me and support me. We all support each other and we all have the same goal- to leave the carcinogens/toxins behind and be HEALTHY, just away from cigarettes! I am not sure why that is so hard to understand. If I were dying of a disease- I would also hope for a health alternative to save me. Vapor saved me, years before it cost me and the public a lot more.

It is a shame to see anyone become addicted to anything. But, please do not be so quick to ban and look badly upon something that is literally saving lives in many ways. Something that so many have broken the addiction with. Maybe it is right to ban them in certain places- understandable not everyone is comfortable with them. But, if some bars still allow smoking- why is vapor not allowed? Especially if it is BETTER for the air and everyone?? I can understand prohibiting them in certain areas, but placing them in close proximity as cigarettes and completely banning them is not beneficial. I am afraid it will drive more to relapse... SO many have *finally* found something that actually works and HELPS in quitting- why take that away and punish those who have worked SO hard to clean up their act and get away from cigarettes?! It isn't just a favor to those who use e-cigs 7 vapor... it is a favor to everyone around, who would otherwise be inhaling the leftover toxins from a habit nobody should have to experience. We can stop the evil in this, but not if we turn our heads at what is helping.

I thank you for taking the time to read this. I hope it may be of some insight to why it has helped to many of us begin living a better life in a more healthy way. And I ask, please, instead of shunning this new alternative and assuming the worst- hear the benefits and see the success stories. We need to support each other in battling our addictions rather than going against one another, not fully understanding we all experience different struggles. Not everything works for the same person, but this has helped many, and I would much rather see something less harmful helping than watching more pick up what will literally kill them.

Best regards-

Angelina Roskam

**Julie Morris**

| | |
|---|---|
| **From:** | irreverend <irreverend23@gmail.com> |
| **Sent:** | Saturday, March 22, 2014 3:29 PM |
| **To:** | Rep. Pete Higgins; Rep. Wes Keller; Rep. Benjamin Nageak; Rep. Lance Pruitt; Rep. Lora Reinbold; Rep. Paul Seaton; Rep. Geran Tarr; Julie Morris |
| **Cc:** | northernlightsvaporco@gmail.com |
| **Subject:** | E-cigarette ban |

I am a resident of Alaska, and while I support banning sales of e-cigarettes to minors, I OPPOSE including smoke-free e-cigarette use within the definition of "smoking."

I took up "vaping" three months ago as a safer alternative to smoking and to improve my overall health. I have been smoke free ever since! It has been the only method that has worked for me. I can breath. I don't smell like an ashtray and have actually been complimented on the pleasant aroma of my e-cigarette. I feel exponentially better physically and knowing that the second-hand is neither offensive nor toxic, like that of cigarette smoke, makes me feel like I am actually doing a favor for the public welfare. Please do not blindly lump e-cigarettes and "vapers" in the same legislation with traditional tobacco cigarettes and smokers. They are NOT the same!

Smoking bans are supposedly enacted to protect the public from the harm of secondhand smoke, but e-cigarettes have not been shown to cause harm to bystanders. In fact, all evidence to date shows that the low health risks associated with e-cigarettes are comparable to other smokeless nicotine products.

The low risks of e-cigarettes is supported by research done by Dr. Siegel of Boston University, Dr. Eissenberg of Virginia Commonwealth, Dr Maciej L Goniewicz of the Roswell Park Cancer Institute, Dr. Laugesen of Health New Zealand, Dr. Igor Burstyn of Drexel University, and by the fact that the FDA testing, in spite of its press statement, failed to find harmful levels of carcinogens or toxic levels of any chemical in the vapor.

A comprehensive review conducted by Dr. Igor Burstyn of Drexel University School of Public Health based on over 9,000 observations of e-cigarette liquid and vapor found "no apparent concern" for bystanders exposed to e-cigarette vapor, even under "worst case" assumptions about exposure.

Electronic cigarette use is easy to distinguish from actual smoking. Although some e-cigarettes resemble real cigarettes, many do not. It is easy to tell when someone lights a cigarette from the smell of smoke. E-cigarette vapor is practically odorless, and generally any detectable odor is not unpleasant and smells nothing like smoke. Additionally, e-cigarette users can decide whether to release any vapor ("discreet vaping"). With so little evidence of use, enforcing use bans on electronic cigarettes would be nearly impossible.

The ability to use electronic cigarettes in public spaces will actually improve public health by inspiring other smokers to switch. Surveys of thousands of users indicate that the majority of those who switch completely replace tobacco cigarettes with the electronic cigarettes, reducing their health risks by an estimated 99%.

Please refer to the following links for more information.
http://casaa.org/
http://casaa.org/Documents.html

Thank you for your time.
Keep Calm
And

Vape On

Concerned citizen and thankful vaper,
Ryan McKeown
Sent via the Samsung Galaxy Note® 3, an AT&T 4G LTE smartphone

**Julie Morris**

**From:** Rosa <rosa_federico@hotmail.com>
**Sent:** Saturday, March 22, 2014 1:54 PM
**To:** Julie Morris
**Subject:** HB360

Hello,
my name is Rosa and I started vaping over a month ago, I have not touched one nasty cigarette since I got my vape. My body, my lungs, me as a person feels so much better. I can even taste food again. E cigarettes (vaporizer) should not be a apart of this bill, it is far more healthier for you than smoking nasty chemicals and getting black tar on your lungs. Plus with the second hand smoke kids breathe in more bad stuff walking through parking lots than they would breathing in vaporizer. I just hope you all will do some research and see that this is better than smoking cigarettes and saving peoples lives by getting them off those cancer filled sticks. I also think that business owners should have the right to decide if you can vape in their store/restaurant or not. And how will anyone be able to try out a product if this bill passes? Being able to try out products like the juices is what makes vaping so much nicer, you don't have to guess what your taste buds like. So please go do some research so you can see how many people are getting saved by switching to this!

Thank you for your time
-Rosa Federico
Thank you
-Rosa Federico

**Julie Morris**

| | |
|---|---|
| **From:** | George Angus <gangus247@gmail.com> |
| **Sent:** | Saturday, March 22, 2014 5:52 PM |
| **To:** | Julie Morris |
| **Cc:** | Rep. Pete Higgins; Rep. Wes Keller; Rep. Benjamin Nageak; Rep. Lance Pruitt |
| **Subject:** | HB360 |

Dear Committee Members:

I am writing to you today to encourage you to NOT support HB 360.

I am a resident of Alaska, and while I support banning sales of e-cigarettes to minors, I OPPOSE including smoke-free e-cigarette use within the definition of smoking.

To that end, I was a smoker for many years and last year I chose to take control of my life and my health by switching to a more health conscious alternative that is allowing me to gradually curb and ultimately eliminate my nicotine addiction in a way that causes virtually no impact to anyone around me.

Please consider:

- Smoking bans are supposedly enacted to protect the public from the harm of secondhand smoke, but e-cigarettes have not been shown to cause harm to bystanders. In fact, all evidence to date shows that the low health risks associated with e-cigarettes are comparable to other smokeless nicotine products.

- The low risks of e-cigarettes is supported by research done by Dr. Siegel of Boston University, Dr. Eissenberg of Virginia Commonwealth, Dr Maciej L Goniewicz of the Roswell Park Cancer Institute, Dr. Laugesen of Health New Zealand, Dr. Igor Burstyn of Drexel University, and by the fact that the FDA testing, in spite of its press statement, failed to find harmful levels of carcinogens or toxic levels of any chemical in the vapor.

- A comprehensive review conducted by Dr. Igor Burstyn of Drexel University School of Public Health based on over 9,000 observations of e-cigarette liquid and vapor found "no apparent concern" for bystanders exposed to e-cigarette vapor, even under "worst case" assumptions about exposure.

- Electronic cigarette use is easy to distinguish from actual smoking. Although some e-cigarettes resemble real cigarettes, many do not. It is easy to tell when someone lights a cigarette from the smell of smoke. E-cigarette vapor is practically odorless, and generally any detectable odor is not unpleasant and smells nothing like smoke. Additionally, e-cigarette users can decide whether to release any vapor ("discreet vaping"). With so little evidence of use, enforcing use bans on electronic cigarettes would be nearly impossible.

- The ability to use electronic cigarettes in public spaces will actually improve public health by inspiring other smokers to switch. Surveys of thousands of users indicate that the majority of those who switch

completely replace tobacco cigarettes with the electronic cigarettes, reducing their health risks by an estimated 99%.

- By switching to a smokeless product, I have greatly reduced my health risks.

Thank you for your time and consideration

George Angus

7041 Lea Street
Palmer, AK 99645
907 982-7244

**Julie Morris**

**Subject:** FW: HB 360

**From:** pam jenny [mailto:pamjenny23@hotmail.com]
**Sent:** Friday, March 21, 2014 7:38 PM
**To:** Rep. Pete Higgins; Rep. Wes Keller; Rep. Benjamin Nageak; Rep. Lance Pruitt; Rep. Lora Reinbold; Rep. Paul Seaton; Rep. Geran Tarr; Julie Morris
**Subject:** HB 360

E-cigs are not tobacco cigarettes and should not be classified as such. There is a lot of good information out there and time should be spent looking at it before choices are made.

I smoked since i was about 12 years old (about 40 yrs). My mother smoked and has died of cancer, she tried off and on over the years to stop...it never worked.

I wish she were still here so she could try this amazing product, that can do what nothing else has and finally feel the satisfaction of tobacco cigarettes not having that hold....
It helped me stop smoking the 1st day of use where patches and other products were a failure.

I was so shocked, i never thought i would be able to stop smoking, wow, it still amazes me.
I have been tobacco free since June, i vape, low nic e-juice.

But let me tell you what i found out from stopping tobacco cigarettes...
It was never about the nicotine and everything about what ever chemicals they have put in cigarettes???
For me i felt fine smoking, a little cough...that's about it, but after stopping i now have a shortness of breath.....i don't know what chemicals are in cigs but they sure mask the harmful affects.

All's i know is that vaping could, can and will save lives.

As for kids they have always smoked and will keep doing it, for me started at 12 at Diamond/Mears in Anchorage in the '70's being kicked out for smoking in the bathroom.....i think vaping would have saved me some life.

Please don't hurt people!!

# CASAA has great info.

Thank you for your time..

**Julie Morris**

**Subject:** FW: Smoking/Vaping Testimonial

**From:** Andrew Paquette [mailto:lowtrips@gmail.com]
**Sent:** Friday, March 21, 2014 4:09 PM
**To:** Julie Morris
**Subject:** Smoking/Vaping Testimonial

Hello

My name is Andrew Paquette. I am a Palmer resident and work at the Matsu Borough as an IT Specialist. I have smoked most of my adult life. I have tried the cold turkey method a few times but it never stuck. I also tried the gum which gave me a nasty itchy cough and also the patch which did nothing for the oral fixation. I even tried the vaping sticks you see at the gas stations now but the technology was nowhere near where it needed to be to get me off smoking. Very unsatisfying! I just recently had a coworker reintroduce me to vaping. I was skeptical because of my past vaping experience but decided maybe it's worth another shot. He took me to Glacier Vapes up Palmer Fishhook and purchased a mod, a couple tanks, and a few eliquid bottles to get started. The flavors and vapor cloud created was amazing! Also the throat feel felt pretty darn close to a standard cigarette which was missing from my first experience with vaping. Since I started using my vaporizer I haven't had one cigarette and I still have half a pack in my truck. Have not even reached for them.

Now like any illogical being I had to look up the possible health hazards of vaping(because regular smoking is so good right?). What I found was very reassuring. There are usually 4 to 5 ingredients involved in making the eliquid. PG(propylene glycol) food grade, VG(Vegetable Glycerin) food grade, Water, Nicotine(if desired), and flavoring (food grade). From what I can tell there isn't much in the way of being hazardous to your health. Nicotine in fact by itself is not that dangerous in smaller doses. About on par with Caffeine or other such stimulants. I believe it can make your heart beat faster and increase blood pressure. My life motto though is moderation. You can kill yourself if you drink too much water! I was also concerned about the effects of the secondhand since I do have a wife and 4 year old son. I found that the studies that have been conducted show that the nicotine in second hand vapor are more than 10 times less than standard secondhand smoke and zero of the other 7000+ harmful chemicals. My child would take in more hazardous chemicals walking through a parking lot into a grocery store with all the terrible fumes coming out of idling vehicles then he would with me vaping in my bedroom.

Bottom line:

I could not be more pleased with my decision to switch over to vaping. My lungs are already feeling better and my wife is thrilled I don't stink every time I come in the house. Vaping is very misunderstood because it does look a lot like smoking and people automatically hate and fear it based on lack of education.

I hope this helps

Thank you

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# Electronic (e-) Cigarettes and Secondhand Aerosol

*"If you are around somebody who is using e-cigarettes, you are breathing an aerosol of exhaled nicotine, ultra-fine particles, volatile organic compounds, and other toxins,"* Dr. Stanton Glantz, Director for the Center for Tobacco Control Research and Education at the University of California, San Francisco.

## Current Legislative Landscape

- As of January 2, 2014, **108 municipalities and three states include e-cigarettes** as products that are prohibited from use in smokefree environments.

## Constituents of Secondhand Aerosol

E-cigarettes do not just emit "harmless water vapor." **Secondhand e-cigarette aerosol (incorrectly called vapor by the industry) contains nicotine, ultrafine particles and low levels of toxins** that are known to cause cancer.

- E-cigarette aerosol is made up of a high concentration of ultrafine particles, and the particle concentration is higher than in conventional tobacco cigarette smoke.[1]

- Exposure to fine and ultrafine particles may exacerbate respiratory ailments like asthma, and constrict arteries which could trigger a heart attack.[2]

- At least 10 chemicals identified in e-cigarette aerosol are on California's Proposition 65 list of carcinogens and reproductive toxins, also known as the Safe Drinking Water and Toxic Enforcement Act of 1986. The compounds that have already been identified in mainstream (MS) or secondhand (SS) e-cigarette aerosol include: **Acetaldehyde (MS), Benzene (SS), Cadmium (MS), Formaldehyde (MS,SS), Isoprene (SS), Lead (MS), Nickel (MS), Nicotine (MS, SS), N-Nitrosonornicotine (MS, SS), Toluene (MS, SS).**[3,4]

- **E-cigarettes contain and emit propylene glycol**, a chemical that is used as a base in e-cigarette solution and is one of the primary components in the aerosol emitted by e-cigarettes.
    - Short term exposure causes eye, throat, and airway irritation.[5]
    - Long term inhalation exposure can result in children developing asthma.[6]

- Even though propylene glycol is FDA approved for use in some products, the inhalation of vaporized nicotine in propylene glycol is not. Some studies show that heating propylene glycol changes its chemical composition, producing small amounts of propylene oxide, a known carcinogen.[7]

- There are **metals in e-cigarette aerosol, including chromium, nickel, and tin nanoparticles**.[8]

- FDA scientists found detectable levels of carcinogenic tobacco-specific nitrosamines in e-cigarette aerosol.[9]

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- People exposed to e-cigarette aerosol absorb nicotine (measured as cotinine), with one study showing levels comparable to passive smokers.[10]

- **Diethylene Glycol**, a poisonous organic compound, was also detected in e-cigarette aerosol.[11]

- **Exhaled e-cigarette aerosol contained propylene glycol, glycerol, flavorings, and nicotine, along with acetone, formaldehyde, acetaldehyde, propanal, diacetin, and triacitine.[12]**

- Many of the elements identified in the aerosol are known to **cause respiratory distress and disease.** The aerosol contained particles >1 μm comprised of tin, silver, iron, nickel, aluminum, and silicate and nanoparticles (<100 nm) of tin, chromium and nickel. The concentrations of nine of eleven elements in e-cigarette aerosol were higher than or equal to the corresponding concentrations in conventional cigarette smoke.[13]

- E-cigarettes cause exposure to different chemicals than found in conventional cigarettes and there is a need for risk evaluation for both primary and passive exposure to the aerosol in smokers and nonsmokers.[14]

- Short term use of e-cigarettes has been shown to increase respiratory resistance and impair lung function, which may result in difficulty breathing.[15]
- Overall, e-cigarettes are a new source of **Volatile Organic Compounds (VOCs) and ultrafine/fine particles in the indoor environment,** thus resulting in "passive vaping."[16]

E-cigarette aerosol is a new source of pollution and toxins being emitted into the environment. We do not know the long-term health effects of e-cigarette use and although the industry marketing of the product implies that these products are harmless, the aerosol that e-cigarettes emit is not purely water vapor.



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BUSINESS DAY

# Selling a Poison by the Barrel: Liquid Nicotine for E-Cigarettes

By MATT RICHTEL MARCH 23, 2014

A dangerous new form of a powerful stimulant is hitting markets nationwide, for sale by the vial, the gallon and even the barrel.

The drug is nicotine, in its potent, liquid form — extracted from tobacco and tinctured with a cocktail of flavorings, colorings and assorted chemicals to feed the fast-growing electronic cigarette industry.

These "e-liquids," the key ingredients in e-cigarettes, are powerful neurotoxins. Tiny amounts, whether ingested or absorbed through the skin, can cause vomiting and seizures and even be lethal. A teaspoon of even highly diluted e-liquid can kill a small child.

But, like e-cigarettes, e-liquids are not regulated by federal authorities. They are mixed on factory floors and in the back rooms of shops, and sold legally in stores and online in small bottles that are kept casually around the house for regular refilling of e-cigarettes.

Evidence of the potential dangers is already emerging. Toxicologists warn that e-liquids pose a significant risk to public health, particularly to children, who may be drawn to their bright colors and fragrant flavorings like cherry, chocolate and bubble gum.

"It's not a matter of if a child will be seriously poisoned or killed," said Lee Cantrell, director of the San Diego division of the California Poison Control System and a professor of pharmacy at the University of

California, San Francisco. "It's a matter of when."

Reports of accidental poisonings, notably among children, are soaring. Since 2011, there appears to have been one death in the United States, a suicide by an adult who injected nicotine. But less serious cases have led to a surge in calls to poison control centers. Nationwide, the number of cases linked to e-liquids jumped to 1,351 in 2013, a 300 percent increase from 2012, and the number is on pace to double this year, according to information from the National Poison Data System. Of the cases in 2013, 365 were referred to hospitals, triple the previous year's number.

Examples come from across the country. Last month, a 2-year-old girl in Oklahoma City drank a small bottle of a parent's nicotine liquid, started vomiting and was rushed to an emergency room.

That case and age group is considered typical. Of the 74 e-cigarette and nicotine poisoning cases called into Minnesota poison control in 2013, 29 involved children age 2 and under. In Oklahoma, all but two of the 25 cases in the first two months of this year involved children age 4 and under.

In terms of the immediate poison risk, e-liquids are far more dangerous than tobacco, because the liquid is absorbed more quickly, even in diluted concentrations.

"This is one of the most potent naturally occurring toxins we have," Mr. Cantrell said of nicotine. But e-liquids are now available almost everywhere. "It is sold all over the place. It is ubiquitous in society."

The surge in poisonings reflects not only the growth of e-cigarettes but also a shift in technology. Initially, many e-cigarettes were disposable devices that looked like conventional cigarettes. Increasingly, however, they are larger, reusable gadgets that can be refilled with liquid, generally a combination of nicotine, flavorings and solvents. In Kentucky, where about 40 percent of cases involved adults, one woman was admitted to the hospital with cardiac problems after her e-cigarette broke in her bed, spilling the e-liquid, which was then absorbed through her skin.

The problems with adults, like those with children, owe to carelessness and lack of understanding of the risks. In the cases of exposure in children, "a lot of parents didn't realize it was toxic until the kid started vomiting," said Ashley Webb, director of the Kentucky Regional Poison Control Center at Kosair Children's Hospital.

The increased use of liquid nicotine has, in effect, created a new kind of recreational drug category, and a controversial one. For advocates of e-cigarettes, liquid nicotine represents the fuel of a technology that might prompt people to quit smoking, and there is anecdotal evidence that is happening. But there are no long-term studies about whether e-cigarettes will be better than nicotine gum or patches at helping people quit. Nor are there studies about the long-term effects of inhaling vaporized nicotine.

Unlike nicotine gums and patches, e-cigarettes and their ingredients are not regulated. The Food and Drug Administration has said it plans to regulate e-cigarettes but has not disclosed how it will approach the issue. Many e-cigarette companies hope there will be limited regulation.

"It's the wild, wild west right now," said Chip Paul, chief executive officer of Palm Beach Vapors, a company based in Tulsa, Okla., that operates 13 e-cigarette franchises nationwide and plans to open 50 more this year. "Everybody fears F.D.A. regulation, but honestly, we kind of welcome some kind of rules and regulations around this liquid."

Mr. Paul estimated that this year in the United States there will be sales of one million to two million liters of liquid used to refill e-cigarettes, and it is widely available on the Internet. Liquid Nicotine Wholesalers, based in Peoria, Ariz., charges $110 for a liter with 10 percent nicotine concentration. The company says on its website that it also offers a 55 gallon size. Vaporworld.biz sells a gallon at 10 percent concentrations for $195.

Mr. Paul said he was worried that some manufacturers outside the United States — China is a major center of e-cigarette production — were not always delivering the concentrations and purity of nicotine they promise. Some retailers, Mr. Paul said, "are selling liquid and they don't

have a clue what is in it."

Cynthia Cabrera, executive director of Smoke Free Alternatives Trade Association, said she would also favor regulations, including those that would include childproof bottles and warning labels, and also manufacturing standards. But she said many companies already were doing that voluntarily, and that parents also needed to take some responsibility.

"You wouldn't leave a bottle of Ajax out," she said. Advocates of e-cigarettes sometimes draw comparisons between nicotine and caffeine, characterizing both as recreational stimulants that carry few risks. But that argument is not established by science, and many health advocates take issue with the comparison.

"There's no risk to a barista no matter how much caffeine they spill on themselves," said Dr. Neal L. Benowitz, a professor at the University of California, San Francisco, who specializes in nicotine research. "Nicotine is different."

Without proper precautions, like wearing gloves while mixing e-liquids, these products "represents a serious workplace hazard," he said.

The nicotine levels in e-liquids varies. Most range between 1.8 percent and 2.4 percent, concentrations that can cause sickness, but rarely death, in children. But higher concentrations, like 10 percent or even 7.2 percent, are widely available on the Internet. A lethal dose at such levels would take "less than a tablespoon," according to Dr. Cantrell, from the poison control system in California. "Not just a kid. One tablespoon could kill an adult," he said.

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# Peering through the mist: What does the chemistry of contaminants in electronic cigarettes tell us about health risks?

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**Abstract**

The aim of this paper is to review available data on chemistry of aerosols and liquids of electronic cigarettes and to make predictions about compliance with occupational exposure limits of personal exposures of vapers (e-cigarette users) to compounds found in the aerosol. Both peer-reviewed and "grey" literatures were accessed and more than 9000 observations of highly variable quality were extracted. Comparisons to the most universally recognized workplace exposure standards, Threshold Limit Values (TLVs), were conducted under "worst case" assumptions about both chemical content of aerosol and liquids as well as behavior of vapers. The calculations reveal that there was no evidence of potential for exposures of e-cigarette users to contaminants that are associated with risk to health at a level that would warrant attention if it were an involuntary workplace exposures by approaching half of TLV. The vast majority of predicted exposures are <<1% of TLV. Predicted exposures to acrolein and formaldehyde are typically <5% TLV. Considering exposure to the aerosol as a mixture of contaminants did not indicate that exceeding half of TLV for mixtures was plausible. Only exposures to the declared major ingredients -- propylene glycol and glycerin -- warrant attention because of precautionary nature of TLVs for exposures to hydrocarbons with no established toxicity. Comparing the exposure to nicotine to existing occupational exposure standards is not valid so long as nicotine-containing liquid is not mislabeled as nicotine-free. It must be noted that the quality of much of the data that was available for these assessment was poor, and so much can be done to improve certainty in this risk assessment. However, the existing research is of the quality that is comparable with most workplace assessments for novel technologies. In summary, an analysis of current state of knowledge about chemistry of liquids and aerosols associated with electronic cigarettes indicates that there is no evidence that vaping produces inhalable exposures to *contaminants* of the aerosol that would warrant health concerns by the standards that are used to ensure safety of workplaces. However, the aerosol generated during vaping as a whole (contaminants *plus declared ingredients*), if it were an emission from industrial process, creates personal exposures that would justify surveillance of health among exposed persons in conjunction with investigation of means to keep health effects as low as reasonably achievable. Exposures of bystanders are likely to be orders of magnitude less, and thus pose no apparent concern.

***Keywords***: vaping, e-cigarettes, tobacco harm reduction, risk assessment, aerosol, occupational exposure limit

**Introduction**

Electronic cigarettes (also known as e-cigarettes) are generally recognized as a safer alternative to combusted tobacco products (reviewed in [1]), but there are conflicting claims about the degree to which these products warrant concern for the health of the vapers (e-cigarette users). A vaper inhales aerosol generated during heating of liquid contained in the e-cigarette. The technology and patterns of use are summarized by Etter [1], though there is doubt about how current, complete and accurate this information is. Rather conclusive evidence has been amassed to date on comparison of the chemistry of aerosol generated by electronic cigarettes to cigarette smoke [2-8]. However, it is meaningful to consider the question of whether aerosol generated by electronic cigarettes would warrant health concerns on its own, in part because vapers will include persons who would not have been smokers and for whom the question of harm reduction from smoking is therefore not relevant, and perhaps more importantly, simply because there is value in minimizing the harm of those practicing harm reduction.

One way of approaching risk evaluation in this setting is to rely on the practice, common in occupational hygiene, of relating the chemistry of industrial processes and the emissions they generate to the potential worst case of personal exposure and then drawing conclusions about whether there would be interventions in an occupational setting based on comparison to occupational exposure limits, which are designed to ensure safety of unintentionally exposed individuals. In that context, exposed individuals are assumed to be adults, and this assumption appears to be suitable for the intended consumers of electronic cigarettes. "Worst case" refers to the maximum personal exposure that can be achieved given what is known about the process that generates contaminated atmosphere (in the context of airborne exposure considered here) and the pattern of interaction with the contaminated atmosphere. It must be noted that harm reduction notions are embedded in this approach since it recognizes that while elimination of the exposure may be both impossible and undesirable, there nonetheless exists a level of exposure that is associated with negligible risks. To date, a comprehensive review of the chemistry of electronic cigarettes and the aerosols they generate has not been conducted, depriving the public of the important element of a risk-assessment process that is mandatory for environmental and occupational health policy making.

The present work considers both the contaminants present in liquids and aerosols as well as the declared ingredients in the liquids. The distinction between exposure to declared ingredients and contaminants of a consumer product is important in the context of comparison to occupational or environmental exposure standards. Occupational exposure limits are developed for unintentional exposures that a person does not elect to experience. For example, being a bread baker is a choice that does not involve election to be exposed to substances that cause asthma that are part of the flour dust (most commonly, wheat antigens and fungal enzymes). Therefore, suitable occupational exposure limits are created to attempt to protect individuals from such risk on the job, with no presumption of "assumed risk" inherent in the occupation. Likewise, special regulations are in effect to protect persons from unintentional exposure to nicotine in workplaces (http://www.cdc.gov/niosh/docs/81-123/pdfs/0446.pdf; accessed July 12, 2013), because in environments where such exposures are possible, it is reasonable to protect individuals who do not wish to experience its effects. In other words, occupational exposure limits are based on protecting people from involuntary and unwanted exposures, and thus can be seen as appropriately more stringent than the standards that might be used for hazards that people intentionally choose to accept.

By contrast, a person who elects to lawfully consume a substance is subject to different risk tolerance, as is demonstrated in the case of nicotine by the fact that legally sold cigarettes deliver doses of nicotine that exceed occupational exposure limits[9]: daily intake of 20 mg of nicotine, assuming nearly 100% absorption in the lungs and

inhalation of 4 $m^3$ of air, corresponds to roughly 10 times the occupational exposure limit of 0.5 $mg/m^3$ atmosphere over 8 hours[10]. Thus, whereas there is a clear case for applicability of occupational exposure limits to contaminants in a consumer product (e.g. aerosol of electronic cigarettes), there is no corresponding case for applying occupational exposure limits to declared ingredients desired by the consumer in a lawful product (e.g. nicotine in the aerosol of an electronic cigarette). Clearly, some limits must be set for voluntary exposure to compounds that are known to be a danger at plausible doses (e.g. limits on blood alcohol level while driving), but the regulatory framework should reflect whether the dosage is intentionally determined and whether the risk is assumed by the consumer. In the case of nicotine in electronic cigarettes, if the main reason the products are consumed is as an alternative source of nicotine compared to smoking, then the only relevant question is whether undesirable exposures that accompany nicotine present health risks, and the analogy with occupational exposures holds. In such cases it appears permissible to allow at least as much exposure to nicotine as from smoking before admitting to existence of new risk. It is expected that nicotine dosage will not increase in switching from smoking to electronic cigarettes because there is good evidence that consumers adjust consumption to obtain their desired or usual dose of nicotine[11]. The situation is different for the vapers who want to use electronic cigarettes without nicotine and who would otherwise not have consumed nicotine. For these individuals, it is defensible to consider total exposure, including that from any nicotine contamination, in comparison to occupational exposure limits. In consideration of vapers who would never have smoked or would have quit entirely, it must be remembered that the exposure is still voluntary and intentional, and comparison to occupational exposure limits is legitimate only for those compounds that the consumer does not elect to inhale.

The specific aims of this review were to:

1. Synthesize evidence on the chemistry of liquids and aerosols of electronic cigarettes, with particular emphasis on the contaminants.
2. Evaluate the quality of research on the chemistry of liquids and aerosols produced by electronic cigarettes.
3. Estimate potential exposures from aerosols produced by electronic cigarettes and compare those potential exposures to occupational exposure standards.

## Methods

*Literature search*

Articles published in peer-reviewed journals were retrieved from *PubMed* (http://www.ncbi.nlm.nih.gov/pubmed/) using combinations of the following keywords: "electronic cigarettes", "e-cigarettes", "smoking alternatives", "chemicals", "risks", "electronic cigarette vapor", "aerosol", "ingredients", "e-cigarette liquid", "e-cig composition", "e-cig chemicals", "e-cig chemical composition", "e-juice electronic cigarette", "electronic cigarette gas", "electronic cigars". In addition, references of the retrieved articles were examined to identify further relevant articles, with particular attention paid to non-peer reviewed reports and conference presentations. Unpublished results obtained through personal communications were also reviewed. The Consumer Advocates for Smoke-free Alternatives Association (CASAA) was asked to review the retrieved bibliography to identify any reports or articles that were missed. The papers and reports were retained for analysis if they reported on the chemistry of e-cigarette liquids or aerosols. No explicit quality control criteria were applied in selection of literature for examination, except that secondary reporting of analytical results was not used. Where substantial methodological problems that precluded interpretation of analytical results were noted, these are described below. For each article that contained relevant analytical results, the compounds quantified, limits of detection, and analytical results were summarized in a spreadsheet. Wherever possible, individual analytical results (rather than averages) were recorded (see electronic **Appendix A**:

https://dl.dropboxusercontent.com/u/4285761/CASAA/eAppendixA.xlsx). Data contained in **Appendix A** is not fully summarized in the current report but can be used to investigate a variety of specific questions that may interest the reader. Each entry in **Appendix A is** identified by a *Reference Manage ID* that is linked to source materials in a list in **Appendix B** (linked via *RefID*: https://dl.dropboxusercontent.com/u/4285761/CASAA/AppendixB.rtf) and attached electronic copies of all original materials (**Biobliography.zip**: https://dl.dropboxusercontent.com/u/4285761/CASAA/bibliography.zip).

*Comparison of observed concentrations in aerosol to occupational exposure limits*

For articles that reported mass or concentration of specific compounds in the aerosol (generated by smoking machines or from volunteer vapers), measurements of compounds were converted to concentrations in the "personal breathing zone",[a] which can be compared to occupational exposure limits (OELs). The 2013 Threshold Limit Values (TLVs)[10] were used as OELs because they are the most up to date and are most widely recognized internationally when local jurisdictions do not establish their own regulations (see http://www.ilo.org/oshenc/part-iv/occupational-hygiene/item/575; accessed July 3, 2013). Whenever there was an uncertainty in how to perform the calculation, a "worst case" scenario was used, as is the standard practice in occupational hygiene, where the initial aim is to recognize potential for hazardous exposures and to err on the side of caution. The following assumptions were made to enable the calculations that approximate the worst-case personal exposure of a vaper (Equation 1):

1. Air the vaper breathes consists of a small volume of aerosol generated by e-cigarettes that contains a specific chemical plus pristine air;
2. The volume of aerosols inhaled from e-cigarettes is negligible compared to total volume of air inhaled;
3. The period of exposure to the aerosol considered was normalized to 8 hours, for comparability to the standard working shift for which TLVs were developed (this does not mean only 8 hours worth of vaping was considered (see point 4) but rather that amount of breathing used to dilute the day's worth of vaping exposure was 8 hours);
4. Consumption of 150 puffs in 8 hours (an upper estimate based on a rough estimate of 150 puffs by a typical vaper in a day[1]) was assumed to be conservative;
5. Breathing rate is 8 liters per minute [12,13];
6. Each puff contains the same quantity of compounds studied.

$$[mg/m^3] = mg/puff \times puffs/(8\ hr\ day) \times 1/(m^3\ air\ inhaled\ in\ 8\ hr) \qquad Eq.\ 1$$

The only exception to this methodology was when assessing a study of aerosol emitted by 5 vapers in a 60 $m^3$ room over 5 hours that seemed to be a sufficient approximation of worst-case "bystander" exposure[6]. All calculated concentrations were expressed as the most stringent (lowest) TLV for a specific compound (i.e. assuming the most toxic form if analytical report is ambiguous) and expressed as "percent of TLV". Considering that all the above calculations are approximate and reflecting that exposures in occupational and general environment can easily vary by a factor of 10 around the mean, we added a 10-fold safety factor to the "percent of TLV" calculation. Details of all calculations are provided in an Excel spreadsheet (see electronic **Appendix C**: https://dl.dropboxusercontent.com/u/4285761/CASAA/eAppendixC.xlsx).

No systematic attempt was made to convert the content of the studied liquids into potential exposures because sufficient information was available on the chemistry of aerosols to use those studies rather than making the necessary

[a] Atmosphere that contains air inhaled by a person

simplifying assumptions to do the conversion. However, where such calculations were performed in the original research, the following approach as used: under the (probably false – see the literature on formation of carbonyl compounds below) assumption of no chemical reaction to generate novel ingredients, composition of liquids can be used to estimate potential for exposure if it can be established how much volume of liquid is consumed in given 8 hours, following an algorithm analogous to the one described above for the aerosols (Equation 2):

$$[mg/m^3] = mg/(mL\ liquid) \times (mL\ liquid)/puff \times puffs/(8\ hr\ day) \times 1/(m^3\ air\ inhaled\ in\ 8\ hr) \qquad Eq.\ 2$$

Comparison to cigarette smoke was not performed here because the fact that e-cigarette aerosol is at least orders of magnitude less contaminated by toxic compounds is uncontroversial [2-8].

**Results and discussion**

*General comments on methods*

In excess of 9,000 determinations of single chemicals (and rarely, mixtures) were reported in reviewed articles and reports, typically with multiple compounds per electronic cigarette tested [2-8,14-42]. Although the quality of reports is highly variable, if one assumes that each report contains some information, this asserts that quite a bit is known about composition of e-cigarette liquids and aerosols. The only report that was excluded from consideration was work of McAuley et al.[23] because of clear evidence of cross-contamination – admitted to by the authors – with cigarette smoke and, possibly, reagents. The results pertaining to non-detection of tobacco-specific nitrosamines (TSNAs) are potentially trustworthy, but those related to PAH are not since it is incredible that cigarette smoke would contain fewer polycyclic aromatic hydrocarbons (PAH; arising in incomplete combustion of organic matter) than aerosol of e-cigarettes that do not burn organic matter [23]. In fairness to the authors of that study, similar problems may have occurred in other studies but were simply not reported, but it is impossible to include a paper in a review once it is known for certain that its quantitative results are not trustworthy. When in doubt, we erred on the side of trusting that proper quality controls were in place, a practice that is likely to increase appearance of atypical or erroneous results in this review. From this perspective, assessment of concordance among independent reports gains higher importance than usual since it is unlikely that two experiments would be flawed in the same exact manner (though of course this cannot be assured).

It was judged that the simplest form of publication bias – disappearance of an entire formal study from the available literature – was unlikely given the exhaustive search strategy and the contested nature of the research question. It is clearly the case that only a portion of all industry technical reports were available for public access, so it is possible that those with more problematic results were systematically suppressed, though there is no evidence to support this speculation. No formal attempt was made to ascertain publication bias *in situ* though it is apparent that anomalous results do gain prominence in typical reviews of the literature: diethylene glycol[43,44] detected at non-dangerous levels (see details below) in one test of 18 of early-technology products by FDA[22] and one outlier in measurement of formaldehyde content of exhaled air [4] and aldehydes in aerosol generated from one e-cigarette in Japan [37]. It must be emphasized that the alarmist report of aldehydes in experiments presented in [37] is based on the concentration in generated aerosol rather than air inhaled by the vaper over prolonged period of time (since vapers do not inhale only aerosol). Thus, results reported in [37] cannot be the basis of any claims about health risk, a fallacy committed both by the authors themselves and commentators on this work [44].

It was also unclear from [37] what the volume of aerosol sampled was – a critical item for extrapolating to personal exposure and a common point of ambiguity in the published reports. However, in a personal exchange with the authors of [37][July 11, 2013], it was clarified that the sampling pump drew air at 500 mL/min through e-cigarette for 10 min, allowing more appropriate calculations for estimation of health risk that are presented below. Such misleading reporting is common in the field that confuses concentration in the aerosol (typically measured directly) with concentration in the air inhaled by the vaper (never determined directly and currently requiring additional assumptions and modeling). This is important because the volume of aerosol inhaled (maximum ~8 L/day) is negligible compared to the volume of air inhaled daily (8L/min); this point is illustrated in the **Figure**.

A similar but more extreme consideration applies to the exposure of bystanders which is almost certainly several orders of magnitude lower than the exposure of vapers. In part this is due to the absorption, rather than exhalation, of a portion of the aerosol by the vapers: there is no equivalent to the "side-stream" component of exposure to conventional cigarettes, so all of the exposure to bystanders results from exhalation. Furthermore, any environmental contamination that results from exhalation of aerosol by vaper will be diluted into the air prior to entering a bystander's personal breathing zone. Lastly, the number of puffs that affects exposure to bystander is likely to be much smaller than that of a vaper unless we are to assume that vaper and bystander are inseparable.

It is unhelpful to report results in cigarette-equivalents, as in [42], because this does not enable one to estimate exposures of vapers . Moreover, there is no value in comparison of the content of e-cigarette aerosol to cigarette smoke when the two products produce emissions that are orders of magnitude apart. To be useful for risk assessment, the results on the chemistry of the aerosols and liquids must be reported in a form that enables the calculations in Equations 1 and 2. It must be also be noted that typical investigations consisted of qualitative and quantitative phases such that quantitative data is available mostly on compounds that passed the qualitative screen. This biased all reports on concentration of compounds towards both higher levels and chemicals which a particular lab was most adept at analyzing.

*Declared Ingredients: comparison to occupational exposure limits*

*Propylene glycol and glycerin* have default or precautionary TLV of 10 mg/m$^3$ over 8 hours set for all organic mists with no specific exposure limits or identified toxicity (http://www.osha.gov/dts/chemicalsampling/data/CH_243600.html; accessed July 5, 2013). These interim TLVs tend to err on the side of being too high and are typically lowered if evidence of harm to health accumulates. For example, in a study that related exposure of theatrical fogs (containing propylene glycol) to respiratory symptoms [45], "mean personal inhalable aerosol concentrations were 0.70 mg/m$^3$ (range 0.02 to 4.1)" [46]. The only available estimate of propylene concentration of propylene glycol in the aerosol indicates personal exposure on the order of 3-4 mg/m$^3$ in the personal breathing zone over 8 hours (under the assumptions we made for all other comparisons to TLVs) [2]. The latest (2006) review of risks of occupational exposure to propylene glycol performed by the Health Council of the Netherlands (known for OELs that are the most protective that evidence supports and based exclusively on scientific considerations rather than also accounting for feasibility as is the case for the TLVs) recommended exposure limit of 50 mg/m$^3$ over 8 hours; concern over short-term respiratory effects was noted [http://www.gezondheidsraad.nl/sites/default/files/200702OSH.pdf; accessed July 29, 2013]. Assuming extreme consumption of the liquid per day via vaping (5 to 25 ml/day and 50-95% propylene glycol in the liquid)[b], levels of propylene glycol in inhaled air can reach 1-6 mg/m$^3$. It has been suggested that propylene glycol is

[b] This estimate of consumption was derived from informal reports from vaping community; 5 ml/day was identified as a high but not rare quantity of consumption and 25 ml/day was the high end of claimed use, though some skepticism was expressed about

very rapidly absorbed during inhalation [4,6] making the calculation under worst case scenario of all propylene glycol becoming available for inhalation credible. It must also be noted that when consuming low-nicotine or nicotine-free liquids, the chance to consume larger volumes of liquid increases (large volumes are needed to reach the target dose or there is no nicotine feedback), leading to the upper end of propylene glycol and glycerin exposure. Thus, estimated levels of exposure to propylene glycol and glycerin are close enough to TLV to warrant concern.

*Nicotine* is present in most liquids and has TLV of 0.5 mg/m$^3$ for average exposure intensity over 8 hours. If approximately 4 m$^3$ of air is inhaled in 8 hours, the consumption of 2 mg nicotine from e-cigarettes in 8 hours would place the vaper at the occupational exposure limit. For a liquid that contains 18 mg nicotine/ml, TLV would be reached upon vaping ~0.1-0.2 ml of liquid in a day, and so is achieved for most anyone vaping nicotine-containing e-cigarettes[1]. Results presented in [24] on 16 e-cigarettes also argue in favor of exceedance of TLV from most any nicotine-containing e-cigarette, as they predict >2mg of nicotine released to aerosol in 150 puffs (daily consumption figure adopted in this report). But as noted above, since delivery of nicotine is the purpose of nicotine-containing e-cigarettes, the comparison to limits on unintended, unwanted exposures does not suggest a problem and serves merely to offer complete context. If nicotine is present but the liquid is labeled as zero-nicotine [24,43], it could be treated as a contaminant, with the vaper not intending to consume nicotine and the TLV, which would be most likely exceeded, is relevant. However, when nicotine content is disclosed, even if inaccurately, then comparison to TLV is not valid. Accuracy in nicotine content is a concern with respect to truth in advertising rather than unintentional exposure, due to self-regulation of consumption by persons who use e-cigarettes as a source of nicotine.

Overall, the declared ingredients in the liquid would warrant a concern by standards used in occupational hygiene, provided that comparison to occupational exposure limits is valid, as discussed in the introduction. However, this is not to say that the exposure is affirmatively believed to be harmful; as noted, the TLVs for propylene glycol and glycerin mists is based on uncertainty rather than knowledge. These TLVs are not derived from knowledge of toxicity of propylene glycol and glycerin mists, but merely apply to any compound of no known toxicity present in workplace atmosphere. This aspect of the exposure from e-cigarettes simply has little precedent (but see study of theatrical fogs below). Therefore, the exposure will provide the first substantial collection evidence about the effects, which calls for monitoring of both exposure levels and outcomes, even though there are currently no grounds to be concerned about the immediate or chronic health effects of the exposure. The argument about nicotine is presented here for the sake of completeness and consistency of comparison to TLVs, but in itself does not affect the conclusions of this analysis because it should not be modeled as if it were a contaminant when declared as an ingredient in the liquid.

*Polycyclic Aromatic Hydrocarbons*

Polycyclic aromatic hydrocarbons (PAH) were quantified in several reports in aerosols [5,6,42] and liquids [7,18,41]. These compounds include well-known carcinogens, the levels of which are not subject to TLV but are instead to be kept "as low as reasonably achievable" (the so called ALARA principle)[10]. For PAH, only non-carcinogenic pyrene that is abundant in the general environment was detected at 36 ng/cartridge in 5 samples of liquid [7]; PAHs were not detected in most of the analyses of aerosols, except for chrysene in the analysis of the aerosol of one e-cigarette[42].

*Tobacco-Specific Nitrosamines*

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whether the latter quantity was truly possible. High-quality formal studies to verify these figures do not yet exist but they are consistent with report of Etter (2012).

The same risk assessment considerations that exist for PAH also hold for carcinogenic tobacco-specific nitrosamines (TSNAs)[47] for which no occupational exposure limits exist because (a) these exposures do not appear to occur in occupational settings often enough to warrant development of TLVs, and (b) it is currently accepted in establishing TLVs that carcinogens do not have minimal thresholds of toxicity. As expected because the TSNAs are contaminants of nicotine from tobacco leaf, there is also evidence of association between nicotine content of the liquid and TSNA concentrations, with reported concentrations <5 ng/cartridge tested [7]. Smaller studies of TSNA content in liquids are variable, with some not reporting any detectable levels [17,32,34] and others clearly identifying these compounds in the liquids when controlling for background contamination (n=9)[22]. Analyses of aerosols indicate that TSNAs are present in amounts that can results in doses of <ng/day[5,32] to µg/day [8] (assuming 150 puffs/day) (see also [42]). The most comprehensive survey of TSNA content of 105 samples of liquids from 11 manufactures indicates that almost all tested liquids (>90%) contained TSNAs in µg/L quantities [35]. This is roughly equivalent to 1/1000 of the concentration of TSNAs in modern smokeless tobacco products (like snus), which are in the ppm range [47]. The TSNA concentration of the liquids is orders of magnitude less than smokeless tobacco products, though the actual dosage from e-cigarettes vs. smokeless tobacco remains to be clearly understood. For example, 10 µg/L (0.01 ppm) of total TSNA in liquid[35] can translate to a daily dose of 0.000025-0.00005 µg from vaping (worst case assumption of 5 ml/day); if 15 g of snus is consumed a day [48] with 1 ppm of TSNAs [47] and half of it were absorbed, then the daily dose is estimated to be 0.008 µg, which is 160-320 times that due to the worst case of exposure from vaping. Various assumptions about absorption of TSNAs alter the result of this calculation by a factor that is dwarfed in magnitude compared to that arising from differences considered above. This is reassuring because smokeless tobacco products, such as snus, pose negligible cancer risk[49], certainly orders of magnitude smaller than smoking (if one considers the chemistry of the products alone). In general, it appears that the cautious approach in face of variability and paucity of data is to seek better understanding of predictors of presence of TSNA in liquids and aerosols so that measures for minimizing exposure to TSNAs from aerosols can be devised. This can include considering better control by manufactures of the nicotine.

*Volatile Organic Compounds*

Total volatile organic compounds (VOC) were determined in aerosol to be non-detectable[3] except in one sample that appeared to barely exceed the background concentration of 1 mg/m$^3$ by 0.73 mg/m$^3$[6]. These results are corroborated by analyses of liquids[18] and most likely testify to insensitivity of employed analytic methods for total VOC for characterizing aerosol generated by e-cigarettes, because there is ample evidence that specific VOC are present in the liquids and aerosols.[c] Information on specific commonly detected VOC in the aerosol is given in **Table 1a**. It must be observed that these reported concentrations are for analyses that first observed qualitative evidence of the presence of a given VOC and thus represent worst case scenarios of exposure when VOC is present (i.e. zero exposures are missing from the overall summary of worst case exposures presented here). For most VOC and aldehydes, one can predict the concentration in air inhaled by a vaper to be <<1% of TLV. The only exceptions to this generalization are:

(a) acrolein: ~1% of TLV (average of 12 measurements) and measurements at a mean of 2% of TLV ( average of 150 measurements)[39,40] and

(b) formaldehyde: between 0 and 3% of TLV based on 18 tests (average of 12 measurements at 2% of TLV, the most reliable test) and an average of 150 results at 4% of TLV [39,40].

[c] The term "VOC" loosely groups together all organic compounds present in aerosol and because the declared ingredients of aerosol are organic compounds, it follows that "VOC are present"

Levels of acrolein in exhaled aerosol reported in [6] were below 0.0016 mg/m$^3$ and correspond to predicted exposure of <1% of TLV (**Table 2**). It must re-emphasized that all calculations based on one electronic cigarette analyzed in [37] are best treated as qualitative in nature (i.e. indicating presence of a compound without any particular meaning attached to the reported level with respect to typical levels) due to great uncertainty about whether the manner in which the e-cigarette was operated could have resulted in overheating that led to generation of acrolein in the aerosol. In fact, a presentation made by the author of [37] clearly stated that the "atomizer, generating high concentration carbonyls, had been burned black" [39,40]. In unpublished work,[39] there are individual values of formaldehyde, acrolein and glyoxal that approach TLV, but it is uncertain how typical these are because there is reason to believe the liquid was overheated; considerable variability among brands of electronic cigarettes was also noted. Formaldehyde and other aldehydes, but not acrolein, were detected in the analysis one e-cigarette [42]. The overwhelming majority of the exposure to specific VOC that are predicted to result from inhalation of the aerosols lie far below action level of 50% of TLV at which exposure has to be mitigated according to current code of best practice in occupational hygiene[50].

Finding of an unusually high level of formaldehyde by Schripp *et al.*[4] – 0.5 ppm predicted vs. 15-minute TLV of 0.3 ppm (not given in **Table 2**) – is clearly attributable to endogenous production of formaldehyde by the volunteer smoker who was consuming e-cigarettes in the experimental chamber, since there was evidence of build-up of formaldehyde prior to vaping and liquids used in the experiments did not generate aerosol with detectable formaldehyde. This places generalizability of other findings from [4] in doubt, especially given that the only other study of exhaled air by vapers who were not current smokers reports much lower concentrations for the same compounds [6] (**Table 2**). It should be noted that the report by Romagna *et al.*[6] employed more robust methodology, using 5 volunteer vapers (no smokers) over an extended period of time. Except for benzene, acetic acid and isoprene, all calculated concentrations for detected VOC were much below 1% of TLV in exhaled air [6]. In summary, these results do not indicate that VOC generated by vaping are of concern by standards used in occupational hygiene.

Diethylene glycol and ethylene glycol became a concern following the report of their detection by FDA[43], but these compounds are not detected in the majority of tests performed to date [3,14,16,18,22]. Ten batches of the liquid tested by their manufacture did not report any diethylene glycol above 0.05% of the liquid [41]. Methods used to detect diethylene glycol appear to be adequate to be informative and capable of detecting the compound in quantities <<1% of TLV[14,16,22]. Comparison to TLV is based on a worst case calculation analogous to the one performed for propylene glycol. For diethylene glycol, TLV of 10 mg/m$^3$ is applicable (as in the case of all aerosols with no know toxicity by inhalation), and there is a recent review of regulations of this compound conducted for the Dutch government by the Health Council of the Netherlands (jurisdiction with some of the most strict occupational exposure limits) that recommended OEL of 70 mg/m$^3$ and noted lack of evidence for toxicity following inhalation [http://www.gezondheidsraad.nl/sites/default/files/200703OSH.pdf; accessed July 29; 2013]. In conclusion, even the quantities detected in the single FDA result were of little concern, amounting to less than 1% of TLV.

*Inorganic compounds*

Special attention has to be paid to the chemical form of compounds when there is detection of metals and other elements by inductively coupled plasma mass spectrometry (ICP-MS)[8,25]. Because the parent molecule that occurs in the aerosol is destroyed in such analysis, the results can be alarmist and not interpretable for risk assessment. For example, the presence of sodium (4.18 µg/10 puffs)[25] does not mean that highly reactive and toxic sodium metal is in the aerosol, which would be impossible given its reactivity, but most likely means the presence of the ubiquitous compound that contains sodium, dissolved table salt (NaCl). If so, the corresponding daily dose of NaCl that arises from

these concentrations from 150 puffs is about 10,000 times lower than allowable daily intake according to CDC (http://www.cdc.gov/features/dssodium/; accessed July 4, 2013). Likewise, a result for presence of silica is meaningless for health assessment unless the crystalline form of $SiO_2$ is known to be present. When such ambiguity exists, a TLV equivalence calculation was not performed. We compared concentrations to TLVs when it was even remotely plausible that parent molecules were present in the aqueous solution. However, even these are to be given credence only in an extremely pessimistic analyst, and further investigation by more appropriate analytical methods could clarify exactly what compounds are present, but is not a priority for risk assessment. It should also be noted that one study that attempted to quantify metals in the liquid found none above 0.1-0.2 ppm levels [7] or above unspecified threshold [18]. **Table 1b** indicates that most metals that were detected were present at <1% of TLV even if we assume that the analytical results imply the presence of the most hazardous molecules containing these elements that can occur in aqueous solution. For example, when elemental chromium was measured, it is compared to TLV for insoluble chromium IV that has the lowest TLV of all chromium compounds. Analyses of metals given in [42] are not summarized here because of difficulty with translating reported units into meaningful terms for comparison with the TLV, but only mercury (again with no information on parent organic compound) was detected in trace quantities, but arsenic, beryllium, chromium, cadmium, lead and nickel were not. Taken as the whole, it can be inferred that there is no evidence of contamination of the aerosol with metals that warrants a health concern.

*Consideration of exposure to a mixture of contaminants*

All calculations conducted so far assumed only one contaminant present in clean air at a time. What are the implications of small quantities of various compounds with different toxicities entering the personal breathing zone at the same time? For evaluation of compliance with exposure limits for mixtures, Equation 3 is used:

$$OEL_{mixture} = \sum_{i=1}^{n} (C_i / TLV_i), \qquad \text{Eq. 3}$$

where $C_i$ is the concentration of the $i^{th}$ compound ($i$=1,...,$n$, where n>1 is the number of ingredients present in a mixture) in the contaminated air and $TLV_i$ is the TLV for the $i^{th}$ compound in the contaminated air; if $OEL_{mixture} > 1$, then there is evidence of the mixture exceeding TLV.

The examined reports detected no more than 5-10 compounds in the aerosol, and the above calculation does not place any of them out of compliance with TLV for mixture. Let us imagine that 50 compounds with TLVs were detected. Given that the aerosol tends to contain various compounds at levels, on average, of no more than 0.5% of TLV (**Table 1**), such a mixture with 50 ingredients would be at 25% of TLV, a level that is below that which warrants a concern, since the "action level" for implementation of controls is traditionally set at 50% of TLV to ensure that the majority of persons exposed have personal exposure below mandated limit [50]. Pellerino et al.[2] reached conclusions similar to this review based on their single experiment: contaminants in the liquids that warrant health concerns were present in concentrations that were less than 0.1% of that allowed by law in the European Union. Of course, if the levels of the declared ingredients (propylene glycol, glycerin, and nicotine) are considered, the action level would be met, since those ingredients are present in the concentrations that are near the action level. There are no known synergistic actions of the examined mixtures, so Equation 3 is therefore applicable. Moreover, there is currently no reason to suspect that the trace amounts of the contaminants will react to create compounds that would be of concern.

**Conclusions**

By the standards of occupational hygiene, current data do not indicate that exposures to vapers from contaminants in electronic cigarettes warrant a concern. There are no known toxicological synergies among compounds in the aerosol, and mixture of the contaminants does not pose a risk to health. However, exposure of vapers to propylene glycol and glycerin reaches the levels at which, if one were considering the exposure in connection with a workplace setting, it would be prudent to scrutinize the health of exposed individuals and examine how exposures could be reduced. This is the basis for the recommendation to monitor levels and effects of prolonged exposure to propylene glycol and glycerin that comprise the bulk of emissions from electronic cigarettes other than nicotine and water vapor. From this perspective, and taking the analogy of work on theatrical fogs [45,46], it can be speculated that respiratory functions and symptoms (but not cancer of respiratory tract or non-malignant respiratory disease) of the vaper is of primary interest. Monitoring upper airway irritation of vapers and experiences of unpleasant smell would also provide early warning of exposure to compounds like acrolein because of known immediate effects of elevated exposures (http://www.atsdr.cdc.gov/toxprofiles/tp124-c3.pdf; accessed July 11, 2013). However, it is questionable how much concern should be associated with observed concentrations of acrolein and formaldehyde in the aerosol. Given highly variable assessments, closer scrutiny is probably warranted to understand sources of this variability, although there is no need at present to be alarmed about exceeding even the occupational exposure limits, since occurrence of occasional high values is accounted for in established TLVs. An important clue towards a productive direction for such work is the results reported in [39,40] that convincingly demonstrate how heating the liquid to high temperatures generates compounds like acrolein and formaldehyde in the aerosol. A better understanding about the sources of TSNA in the aerosol may be of some interest as well, but all results to date consistently indicate quantities that are of no more concern than TSNA in smokeless tobacco products. Exposures to nicotine from electronic cigarettes is not expected to exceed that from smoking due to self-titration[11]; it is only a concern when a vaper does not intend to consume nicotine, a situation that can arise from incorrect labeling of liquids[24,43].

The cautions about propylene glycol and glycerin apply only to the exposure experienced by the vapers themselves. Exposure of bystanders to the listed ingredients, let alone the contaminants, does not warrant a concern as the exposure is likely to be orders of magnitude lower than exposure experienced by vapers. Further research employing realistic conditions could help quantify the quantity of exhaled aerosol and its behavior in the environment under realistic worst-case scenarios (i.e., not small sealed chambers), but this is not a priority since the exposure experienced by bystanders is clearly very low compared to the exposure of vapers, and thus there is no reason to expect it would have any health effects.

The key to making the best possible effort to ensure that hazardous exposures from contaminants do not occur is ongoing monitoring of actual exposures and estimation of potential ones. Direct measurement of personal exposures is not possible in vaping due to the fact the aerosol is inhaled directly, unless, of course, suitable biomarkers of exposure can be developed. The current review did not identify any suitable biomarkers, though cotinine is a useful proxy for exposure to nicotine-containing liquids. Monitoring of potential composition of exposures is perhaps best achieved though analysis of aerosol generated in a manner that approximates vaping, for which better insights are needed on how to modify "smoking machines" to mimic vaping given that there are documented differences in inhalation patterns[51]. These smoking machines would have to be operated under a realistic mode of operation of the atomizer to ensure that the process for generation of contaminants is studied under realistic temperatures. To estimate dosage (or exposure in personal breathing zone), information on the chemistry of aerosol has to be combined with models of the inhalation pattern of vapers, mode of operation of e-cigarettes and quantities of liquid consumed. Assessment of

exhaled aerosol appears to be of little use in evaluating risk to vapers due to evidence of qualitative differences in the chemistry of exhaled and inhaled aerosol.

Monitoring of liquid chemistry is easier and cheaper than assessment of aerosols. This can be done systematically as a routine quality control measure by the manufacturers to ensure uniform quality of all production batches. However, we do not know how this relates to aerosol chemistry because previous researchers have failed to appropriately pair analyses of chemistry of liquids and aerosols. It is standard practice in occupational hygiene to analyze the chemistry of materials generating an exposure, and it is advisable that future studies of the aerosols explicitly pair these analyses with examination of composition of the liquids used to generate the aerosols. Such an approach can lead to the development of predictive models that relate the composition of the aerosol to the chemistry of liquids, the e-cigarette hardware, and the behavior of the vaper, as these, if accurate, can anticipate hazardous exposures before they occur. The current attempt to use available data to develop such relationships was not successful due to studies failing to collect appropriate data. Systematic monitoring of quality of the liquids would also help reassure consumers and is best done by independent laboratories rather than manufactures to remove concerns about impartiality (real or perceived).

Future work in this area would greatly benefit from standardizing laboratory protocols (e.g. methods of extraction of compounds from aerosols and liquids, establishment of "core" compounds that have to be quantified in each analysis (as is done for PAH and metals), development of minimally informative detection limits that are needed for risk assessment, standardization of operation of "vaping machine", etc.), quality control experiments (e.g. suitable positive and negative controls without comparison to conventional cigarettes, internal standards, estimation of %recovery, etc.), and reporting practices (e.g. in units that can be used to estimate personal exposure, use of uniform definitions of limits of detection and quantification, etc.), all of which would improve on the currently disjointed literature. Detailed recommendations on standardization of such protocols lie outside of scope of this report.

All calculations conducted in this analysis are based on information about patterns of vaping and the content of aerosols and liquids that are highly uncertain in their applicability to "typical" vaping as it is currently practiced and says even less about future exposures due to vaping. However, this is similar to assessments that are routinely performed in occupational hygiene for novel technology as it relied on "worst case" calculations and safety margins that attempt to account for exposure variability. The approach adopted here and informed by some data is certainly superior to some currently accepted practices in the regulatory framework in occupational health that rely purely on description of emission processes to make claims about potential for exposure (e.g.[52]). Clearly, routine monitoring of potential and actual exposure is required if we were to apply the principles of occupational hygiene to vaping. Detailed suggestions on how to design such exposure surveillance are available in [53].

In summary, analysis of the current state of knowledge about the chemistry of *contaminants* in liquids and aerosols associated with electronic cigarettes indicates that there is no evidence that vaping produces inhalable exposures to these contaminants at a level that would prompt measures to reduce exposure by the standards that are used to ensure safety of workplaces. Indeed, there is sufficient evidence to be reassured that there are no such risks from the broad range of the studied products, though the lack of quality control standards means that this cannot be assured for all products on the market. However, aerosol generated during vaping on the whole, when considering the declared ingredients themselves, if it were treated in the same manner as an emission from industrial process, creates personal exposures that would justify surveillance of exposures and health among exposed persons. Due to the uncertainty about the effects of these quantities of propylene glycol and glycerin, this conclusion holds after setting aside concerns about health effects of nicotine. This conclusion holds notwithstanding the benefits of tobacco harm reduction, since

there is value in understanding and possibly mitigating risks even when they are known to be far lower than smoking. It must be noted that the proposal for such scrutiny of "total aerosol" is not based on specific health concerns suggested by compounds that resulted in exceedance of occupational exposure limits, but is instead a conservative posture in the face of unknown consequences of inhalation of appreciable quantities of organic compounds that may or may not be harmful at doses that occur during vaping.

**Key Conclusions:**

- Even when compared to workplace standards for involuntary exposures, and using several conservative (erring on the side of caution) assumptions, the exposures from using e-cigarettes fall well below the threshold for concern for compounds with known toxicity. That is, even ignoring the benefits of e-cigarette use and the fact that the exposure is actively chosen, and even comparing to the levels that are considered unacceptable to people who are not benefiting from the exposure and do not want it, the exposures would not generate concern or call for remedial action.
- Expressed concerns about nicotine only apply to vapers who do not wish to consume it; a voluntary (indeed, intentional) exposure is very different from a contaminant.
- There is no serious concern about the contaminants such as volatile organic compounds (formaldehyde, acrolein, etc.) in the liquid or produced by heating. While these contaminants are present, they have been detected at problematic levels only in a few studies that apparently were based on unrealistic levels of heating.
- The frequently stated concern about contamination of the liquid by a nontrivial quantity of ethylene glycol or diethylene glycol remains based on a single sample of an early technology product (and even this did not rise to the level of health concern) and has not been replicated.
- Tobacco-specific nitrosamines (TSNA) are present in trace quantities and pose no more (likely much less) threat to health than TSNAs from modern smokeless tobacco products, which cause no measurable risk for cancer.
- Contamination by metals is shown to be at similarly trivial levels that pose no health risk, and the alarmist claims about such contamination are based on unrealistic assumptions about the molecular form of these elements.
- The existing literature tends to overestimate the exposures and exaggerate their implications. This is partially due to rhetoric, but also results from technical features. The most important is confusion of the concentration in aerosol, which on its own tells us little about risk to heath, with the relevant and much smaller total exposure to compounds in the aerosol averaged across all air inhaled in the course of a day. There is also clear bias in previous reports in favor of isolated instances of highest level of chemical detected across multiple studies, such that average exposure that can be calculated are higher than true value because they are "missing" all true zeros.
- Routine monitoring of liquid chemistry is easier and cheaper than assessment of aerosols. Combined with an understanding of how the chemistry of the liquid affects the chemistry of the aerosol and insights into behavior of vapers, this can serve as a useful tool to ensure the safety of e-cigarettes.
- The only unintentional exposures (i.e., not the nicotine) that seem to rise to the level that they are worth further research are the carrier chemicals themselves, propylene glycol and glycerin. This exposure is not known to cause health problems, but the magnitude of the exposure is novel and thus is at the levels for concern based on the lack of reassuring data.

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**Figure: Illustrating the difference between concentrations in the aerosol generated by vaping and inhaled air in a day.** *Panel A* shows black square that represents aerosol contaminated by some compound as it would be measured by a "smoking machine" and extrapolated to dosage from vaping in one day. This black square is located inside the white square that represents total uncontaminated air that is inhaled in a day by a vaper. The relative sizes of the two squares are exaggerated as the volume of aerosol generated in vaping relative to inhaled air is much smaller in the figure. *Panel B* shows how exposure from contaminated air (black dots) is diluted over a day for appropriate comparison to occupational exposure limits that are expressed in terms of "time-weighted average" or average contamination over time rather than as instantaneous exposures (with the exception of "ceiling limits" that do not affect the vast majority of comparisons in this report). Exposure during vaping occurs in a dynamic process where the atmosphere inhaled by the vaper alternates between the smaller black and larger white squares in *Panel A*. Thus, the concentration of contaminants that a vaper is exposed to over a day is much smaller than that which is measured in the aerosol (and routinely improperly cited as reason for concern about "high" exposures).

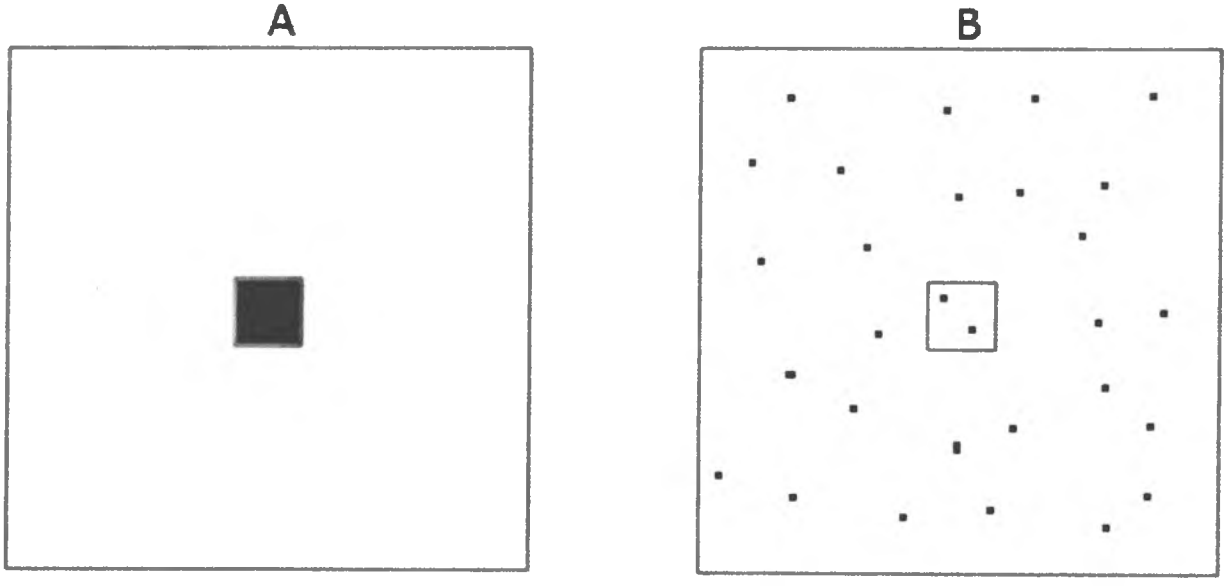

**Table 1a: Exposure predictions based on analysis of aerosols generated by smoking machines: Volatile Organic Compounds**

| Compound | N# | Estimated concentration in personal breathing zone | | Ratio of most stringent TLV (%) | | Reference |
|---|---|---|---|---|---|---|
| | | PPM | mg/m$^3$ | Calculated directly | Safety factor 10 | |
| Acetaldehyde | 1 | 0.005 | | **0.02** | **0.2** | [5] |
| | 3 | 0.003 | | **0.01** | **0.1** | [4] |
| | 12 | 0.001 | | **0.004** | **0.04** | [8] |
| | 1 | 0.00004 | | **0.0001** | **0.001** | [3] |
| | 1 | 0.0002 | | **0.001** | **0.008** | [3] |
| | 150 | 0.001 | | **0.004** | **0.04** | [39,40] |
| | 1 | 0.008 | | **0.03** | **3** | [37] |
| Acetone | 1 | 0.002 | | **0.0003** | **0.003** | [37] |
| | 150 | 0.0004 | | **0.0001** | **0.001** | [39,40] |
| Acrolein | 12 | 0.001 | | **1** | **13** | [8] |
| | 150 | 0.002 | | **2** | **20** | [39,40] |
| | 1 | 0.006 | | **6** | **60** | [37] |
| Butanal | 150 | 0.0002 | | **0.001** | **0.01** | [39,40] |
| Crotonaldehyde | 150 | | 0.0004 | **0.01** | **0.1** | [39,40] |
| Formaldehyde | 1 | 0.002 | | **0.6** | **6** | [5] |
| | 3 | 0.008 | | **3** | **30** | [4] |
| | 12 | 0.006 | | **2** | **20** | [8] |
| | 1 | <0.0003 | | **<0.1** | **<1** | [3] |
| | 1 | 0.0003 | | **0.1** | **1** | [3] |
| | 150 | 0.01 | | **4** | **40** | [39,40] |
| | 1 | 0.009 | | **3** | **30** | [37] |
| Glyoxal | 1 | | 0.002 | **2** | **20** | [37] |
| | 150 | | 0.006 | **6** | **60** | [39,40] |
| o-Methylbenzaldehyde | 12 | | 0.001 | **0.05** | **0.5** | [8] |
| p,m-Xylene | 12 | | 0.00003 | **0.001** | **0.01** | [8] |
| Propanal | 3 | 0.002 | | **0.01** | **0.1** | [4] |
| | 150 | 0.0006 | | **0.002** | **0.02** | [39,40] |
| | 1 | 0.005 | | **0.02** | **0.2** | [37] |
| Toluene | 12 | 0.0001 | | **0.003** | **0.03** | [8] |
| Valeraldehyde | 150 | | 0.0001 | **0.0001** | **0.001** | [39,40] |

# average is presented when N>1

**Table 1b: Exposure predictions based on analysis of aerosols generated by smoking machines: Inorganic Compounds#**

| Element quantified | Assumed compound containing the element for comparison with TLV | N## | Estimated concentration in personal breathing zone ($mg/m^3$) | Ratio of most stringent TLV (%) | | Reference |
|---|---|---|---|---|---|---|
| | | | | Calculated directly | Safety factor 10 | |
| Aluminum | Respirable Al metal & insoluble compounds | 1 | 0.002 | **0.2** | **1.5** | [25] |
| Barium | Ba & insoluble compounds | 1 | 0.00005 | **0.01** | **0.1** | [25] |
| Boron | Boron oxide | 1 | 0.02 | **0.1** | **1.5** | [25] |
| Cadmium | Respirable Cd & compounds | 12 | 0.00002 | **1** | **10** | [8] |
| Chromium | Insoluble Cr (IV) compounds | 1 | 3E-05 | **0.3** | **3** | [25] |
| Copper | Cu fume | 1 | 0.0008 | **0.4** | **4.0** | [25] |
| Iron | Soluble iron salts, as Fe | 1 | 0.002 | **0.02** | **0.2** | [25] |
| Lead | Inorganic compounds as Pb | 1 | 7E-05 | **0.1** | **1** | [25] |
| | | 12 | 0.000025 | **0.05** | **0.5** | [8] |
| Magnesium | Inhalable magnesium oxide | 1 | 0.00026 | **0.003** | **0.03** | [25] |
| Manganese | Inorganic compounds, as Mn | 1 | 8E-06 | **0.04** | **0.4** | [25] |
| Nickel | Inhalable soluble inorganic compounds, as Ni | 1 | 2E-05 | **0.02** | **0.2** | [25] |
| | | 12 | 0.00005 | **0.05** | **0.5** | [8] |
| Potassium | KOH | 1 | 0.001 | **0.1** | **1** | [25] |
| Tin | Organic compounds, as Sn | 1 | 0.0001 | **0.1** | **1** | [25] |
| Zinc | Zinc chloride fume | 1 | 0.0004 | **0.04** | **0.4** | [25] |
| Zirconium | Zr and compounds | 1 | 3E-05 | **0.001** | **0.01** | [25] |
| Sulfur | $SO_2$ | 1 | 0.002 | **0.3** | **3** | [25] |

# The actual molecular form in the aerosol unknown and so worst case assumption was made if it was physically possible (e.g. it is not possible for elemental lithium & sodium to be present in the aerosol); there is no evidence from the research that suggests the metals were in the particular highest risk form, and in most cases a general knowledge of chemistry strongly suggests that this is unlikely. Thus, the TLV ratios reported here probably do not represent the (much lower) levels that would result if we knew the molecular forms.

## average is presented when N>1

**Table 2: Exposure predictions for volatile organic compounds based on analysis of aerosols generated by volunteer vapers**

| Compound | N# | Estimated concentration in personal breathing zone (ppm) | Ratio of most stringent TLV (%) | | Reference |
|---|---|---|---|---|---|
| | | | Calculated directly | Safety factor 10 | |
| 2-butanone (MEK) | 3 | 0.04 | **0.02** | 0.2 | [4] |
| | 1 | 0.002 | **0.0007** | 0.007 | [6] |
| 2-furaldehyde | 3 | 0.01 | **0.7** | 7 | [4] |
| Acetaldehyde | 3 | 0.07 | **0.3** | 3 | [4] |
| Acetic acid | 3 | 0.3 | **3** | 30 | [4] |
| Acetone | 3 | 0.4 | **0.2** | 2 | [4] |
| Acrolein | 1 | <0.001 | **<0.7** | <7 | [6] |
| Benzene | 3 | 0.02 | **3** | 33 | [4] |
| Butyl hydroxyl toluene | 1 | 4E-05 | **0.0002** | 0.002 | [6] |
| Isoprene | 3 | 0.1 | **7** | 70 | [4] |
| Limonene | 3 | 0.009 | **0.03** | 0.3 | [4] |
| | 1 | 2E-05 | **0.000001** | 0.00001 | [6] |
| m,p-Xyelen | 3 | 0.01 | **0.01** | 0.1 | [4] |
| Phenol | 3 | 0.01 | **0.3** | 3 | [4] |
| Propanal | 3 | 0.004 | **0.01** | 0.1 | [4] |
| Toluene | 3 | 0.01 | **0.07** | 0.7 | [4] |

# average is presented when N>1

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RESEARCH ARTICLE

# Comparison of the effects of e-cigarette vapor and cigarette smoke on indoor air quality

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**Abstract**

*Context*: Electronic cigarettes (e-cigarettes) have earned considerable attention recently as an alternative to smoking tobacco, but uncertainties about their impact on health and indoor air quality have resulted in proposals for bans on indoor e-cigarette use.

*Objective*: To assess potential health impacts relating to the use of e-cigarettes, a series of studies were conducted using e-cigarettes and standard tobacco cigarettes.

*Methods and materials*: Four different high nicotine e-liquids were vaporized in two sets of experiments by generic 2-piece e-cigarettes to collect emissions and assess indoor air concentrations of common tobacco smoke by products. Tobacco cigarette smoke tests were conducted for comparison.

*Results*: Comparisons of pollutant concentrations were made between e-cigarette vapor and tobacco smoke samples. Pollutants included VOCs, carbonyls, PAHs, nicotine, TSNAs, and glycols. From these results, risk analyses were conducted based on dilution into a 40 $m^3$ room and standard toxicological data. Non-cancer risk analysis revealed "No Significant Risk" of harm to human health for vapor samples from e-liquids (A-D). In contrast, for tobacco smoke most findings markedly exceeded risk limits indicating a condition of "Significant Risk" of harm to human health. With regard to cancer risk analysis, no vapor sample from e-liquids A-D exceeded the risk limit for either children or adults. The tobacco smoke sample approached the risk limits for adult exposure.

*Conclusions*: For all byproducts measured, electronic cigarettes produce very small exposures relative to tobacco cigarettes. The study indicates no apparent risk to human health from e-cigarette emissions based on the compounds analyzed.

**Keywords:** E-cigarette, e-cig, ecigarette, ecig, emissions, vaping, nicotine vaporizer, SHS, secondhand vapor, SHV, eliquid, e-liquid, vapor, TSNA, VOC, PAH, DEG, PG, carbonyl, glycerine, cancer risk, risk estimate, exposure assessment, tobacco smoke, risk assessment, toxicity, indoor air quality, inhalation

## Introduction

Introduced in the United States in 2007, electronic cigarettes (e-cigarettes) have quickly become a popular substitute for traditional tobacco cigarettes (Ayers et al., 2011). This substitution appears to be due to health concerns of smokers, increased cost of tobacco cigarettes, and indoor smoking restrictions (Etter & Bullen, 2011). A number of surveys and studies have shown that a substantial number of smokers significantly reduce tobacco use and/or transition completely from tobacco cigarettes to electronic cigarettes. (Bullen et al., 2010; Etter, 2010; Etter & Bullen, 2011; Foulds et al., 2011; McQueen et al., 2011; Polosa et al., 2011; Siegel et al., 2011). Currently, there are only two states that have a statewide ban on e-cigarette use in places where smoking is prohibited. However, dozens of municipalities and counties have discussed and/or introduced pending legislation that would ban the use of e-cigarettes where smoking is prohibited. Prior studies have examined e-cigarettes and e-liquids using

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Gas Chromatography/Mass Spectrometry (GC/MS) to assess the nature and concentrations of pollutants generated from e-cigarettes with different e-liquids (FDA, 2009; Laugesen et al., 2008; Trehy et al., 2011; Lauterbach et al., 2012). Although studies have provided information on the pollutants that could be generated from the vapors, there are no peer reviewed studies that assessed the impact of these air pollutants on overall indoor air quality and exposures.

## Experimental methods

### Setup

An e-cigarette comes in either two pieces or three pieces and uses a battery that is activated either manually or pneumatically to heat a metal coil (atomizer) that vaporizes the e-liquid in a cartridge (Figure 1). Three piece e-cigarettes have a cartridge which holds the e-liquid to be vaporized, a heating element called an atomizer and a battery to activate the heating element. In two piece e-cigarettes the atomizer and cartridge are combined and called a cartomizer. Two sets of measurements (phases I and II) were made using standard, pneumatic pressure-activated, two-piece e-cigarettes.

A fully charged and tested battery was used for each sample collected. Twelve new cartomizers were filled to capacity with 1.8 mL of e-liquid each from four different-liquid bottles labeled A, B, C and D (three samples from each bottle) using sterile 18 gauge syringes. The four popular e-liquid brands were tobacco flavored and extra high nicotine strength, the highest commonly used level of nicotine (24 mg/mL or 26 mg/mL depending on manufacturer). The same liquid samples were used for both phase I and II. All four liquids and actual tobacco cigarettes (Marlboro Red) were used in both phases. Each brand was studied in triplicate in phase I. In phase II, the e-liquids were repeated three times, but the cigarettes were only duplicated due to some filter cassettes being damaged during shipping. During both phase I and phase II, blank samples were collected using the same setup as for the actual tests without any cigarette or e-cigarette in the smoking machine. These samples were to assess any baseline gaseous species that may be present as a result of off-gassing from the polyethylene bag. No off-gassing from the bag was evident based on the low values obtained from the analyses of the blank samples (Table 1).

Figure 2 shows the experimental setup. Polyethylene glove bags (37″ L × 37″ W × 25″ H; Glas-Col, Terre Haute, IN) were used for collection. Around one hundred and ten liters of commercial zero air were introduced as the dilution air. A Single Cigarette Smoking Machine meeting FTC and ISO requirements as suggested by Lauterbach et al. (2012) (SCSM; CH Technology, Westwood, NJ) was connected to the bag. The e-cigarettes and tobacco cigarettes were connected to the smoking machine to simulate the smoking. Although studies have shown slightly increased levels of some VOCs analyzed in this study in the exhaled breath of nonsmokers (Wallace & Pellizzari, 1995; Gordon et al., 2002), these studies suggest such emissions are likely due to environmental factors such as exposure to gasoline or environmental tobacco smoke (ETS). Schripp et al. (2012) measured VOC levels of exhaled vapor or smoke from an e-cigarette user and cigarette smoker respectively and their results were comparable to our findings. Based on these results, the authors make the assumption that although there may have been lower levels of some compounds assessed in e-cigarette vapor if the vapor had first been inhaled and partially absorbed by the e-cigarette user, it is unlikely there would be significantly higher levels of most of the compounds tested for.

For each e-cigarette trial, 50 puffs of 50 mL per puff (4 s/puff, every 30 s) were used. For the tobacco cigarettes, the puff lasted 2 s with the smoke volume as 35 mL as per the Federal Trade Commission (FTC) protocol (Bradford et al., 1936; Ogg, 1964; International Standards Organization [ISO], 2000). The increased duration of puff for the e-cigarettes was based on direct

Table 1. Phase I and II pollutants sampled for and media for sampling.

| Pollutant | Filter type/coating | Method of analysis |
|---|---|---|
| Nicotine | $Na_2SO_4$ | GC/NPD |
| TSNAs | Teflon | GC/MS |
| PAHs | XAD | GC/MS |
| PG | XAD | GC/MS |
| DEG | XAD | GC/MS |
| VOCs | Multisorbent Tubes | HS-GC/MS |
| Carbonyls | Quartz Filter | HPLC-UV |

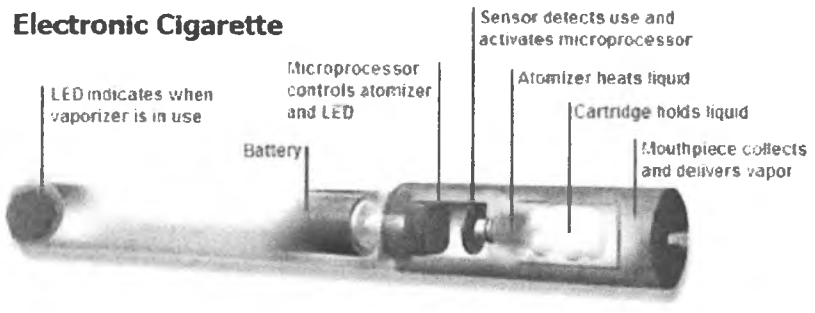


Figure 1. Image of cross section of e-cigarette components.

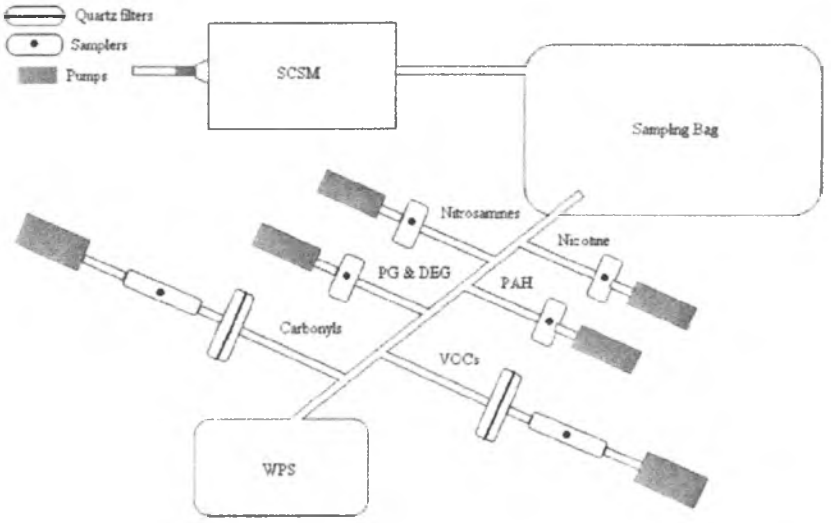


Figure 2. Illustration of the setup for capturing the pollutants after the vapor or smoke was released from the smoking machine.

observation of e-cigarette use at a gathering for e-cigarette users where puff length average was found to be 4 s. Longer puff duration was also used by Lauterbach et al. (2012). This study was a target compound analysis of tobacco smoke-specific pollutants. Six different types of pollutants were sampled: Nicotine, tobacco specific nitrosamines (TSNAs) (N'-nitrosonornicotine (NNN), N'nitrosoanatabine (NAT), N'nitrosanabasine (NAB), and 4-(methylnitrosamino-1-(3-pyridyl)-1-butanone(NNK)), polyaromatic hydrocarbon's (PAHs), glycols (propylene glycol/PG and diethylene glycol/DEG), volatile organic compounds (VOCs) and carbonyls (i.e. formaldehyde, acrolein, acetaldehyde). The flow rates through these samplers were 265 mL/min, 250 mL/min, 235 mL/min, 250 mL/min, 180 mL/min and 200 mL/min, respectively. For the first four species, filter cassettes were prepared by a certified laboratory according to the protocol described by Hammond et al. (1987). The glycol sampler used an XAD-4 impregnated quartz filter using a procedure similar to that described by Lewtas et al. (2001). A 47 mm quartz filter (Pall, Quartz 47 mm, 2 μm pore size, USA) was placed in front of the sampling tube for VOCs and carbonyls to remove particles. The filter was replaced for each trial. Preconditioned thermal desorption tubes (SUPELCO, USA) were used to collect VOC samples. Sorbent tubes (catalog #226-119; SKC, Eighty Four, PA) and the filters in ChemDisk Personal Samplers (Assay Technology, USA) were used for carbonyl collection in the two phases, respectively. The latter impregnated filters were used for phase II as prior to beginning phase II there was a shortage of the sorbent tubes used in phase I. The sorbent tubes and impregnated filters used 2,4-dinitrophenylhydrazine (DNPH) to collect carbonyls for an EPA TO-11 type analysis. Each species had its own sampling pump. A Wide Range Particle Spectrometer (WPS) (Model 1000 XP, MSP Corporation, Shoreview, MN) was used to measure particle number size distributions. The WPS is designed to sample particle ranges from 10 nm to 10 um. The total WPS flow rate was 1 LPM of which 0.3 LPM was for the differential mobility analyzer (DMA) aerosol flow and 0.7 LPM was for the laser particle spectrometer (LPS) aerosol flow. The sampling bag was changed after each trial. In addition, the smoking machine was cleaned with ethanol to prevent any cross contamination between the samples.

After sampling, the cassettes used for nicotine, nitrosamines (NNN, NAT, NAB, NNK), polyaromatic hydrocarbons (PAHs), propylene glycol (PG) and diethylene glycol (DEG) samples were packed in dry ice for shipment to the laboratory for analysis.

## Analysis

### *VOCs and carbonyls*

#### *VOCs*

VOC samples were stored in a freezer at −20°C before analysis. The concentrations of the VOC species were determined using a modified EPA Method TO-17 procedure (USEPA, 1999a). Using an Entech Model 5400 (Entech Instruments, Simi Valley, CA), the samples were individual thermally desorbed into silonized bottles. Conventional thermal desorption provides only one opportunity to make the measurement. However, by desorption into the equivalent of a canister, a second analysis can be performed if there are problems with the initial analytical run. The partial contents of the bottle were introduced to a cryogenic preconcentrator (Model 7100A, Entech Instruments), and then flash evaporated into and analyzed with a Finnigan Gas Chromatography-Ion Trap Mass Spectrometry (GC/MS, Trace GC with Polaris Q MS, ThermoFinnnigan, San Jose, CA).

#### *Carbonyls*

Each carbonyl sample was placed into a brown glass vial to avoid any photodecomposition and was

extracted with 1 mL of acetonitrile (ACN) for 1 h using a Standard Orbital Shaker (VWR, Model 3500, Houston, Texas). The extracts were then analyzed using the EPA TO-11HPLC/UV method (USEPA, 1999b). In brief, a 20 µL aliquot was injected to the HPLC/UV analysis system (Surveyor PDA Detector, Surveyor Autosampler, Surveyor LC Pump, Thermo Electron). A Nova-Pak C18 analytical column (3.9 × 150 mm, Waters, Milford, MA) was used for the separation of the carbonyl-DNPH derivatives. The mobile phase contains two mixed solutions: A = ACN/water 60/40 (v/v) and B = water/ACN/tetrahydrofuran 60/30/10 (v/v/v). The LC pump setup was 100% B solution for 2 min, followed by linear gradient from 100% B to 100% A in 10 min and then 100% A for another 13 min. The mobile flow rate was 1 LPM and the samples were analyzed with UV detection at 365 nm.

Blank and 1 ppm standard were run every nine samples as the quality control. The extraction efficiency was determined as 95–105% in general for the target analyses by spiking a known amount of the standard mixture (Air Monitoring Aldehyde-DNPH Mix, AccuStandard, New Haven, CT) to the sample matrix. The relative standard deviation of the 7 repeated injections of a mid-level standard was around 2–10 % for all the target compounds.

#### *PAHs*

The PAHs to be quantified were naphthalene, acenaphthylene, acenapthene, fluorine, anthracene, henanthrene, fluoranthene, pyrene, benz(a)anthracene, chrysene, retene, benzo(b)fluoranthene benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenz(a, h) anthracene, and benzo(ghi)perylene. Samples were collected on Pallflex 2500QAT Quartz fiber filters, treated with ground XAD-4 resin. Serial dilutions of the stock standard were made in dichloromethane. The standards were run with PAH samples that were extracted and reduced from filters. Samples are extracted by sonication in dichloromethane, followed by evaporation to 0.5 mL. A Hewlett Packard 6890 gas Chromatograph equipped with a 5972 Mass Selective detector was used to perform the analysis. The column used is an Agilent Technologies part #122-5562, DB-5MS fused silica capillary column with the following specifications: length 60 m, diameter 250 µm, film thickness.25 µm. The inlet temperature was 300°C. The oven conditions were 80°C, increased by 5°C/min to 300°C, hold for 20 min.

#### *Nicotine*

Samples were collected on Pallflex TX40HI20 Teflon coated fiber filters. Extraction of nicotine from treated filters was performed by liquid-liquid extraction of the filters by vortexing in NaOH and heptane. The 0.5 mL organic layer was removed from the solution and injected into the Gas Chromatograph. A Hewlett Packard 7890 Gas Chromatograph equipped with a Nitrogen Phosphorus detector was used to perform the analysis. The column used was an Agilent Technologies part #123-5012E, DB-5MS fused silica capillary column with the following specifications: length 15 m, diameter 320 µm, film thickness.25 µm. The inlet temperature was 235°C. The oven conditions were 60°C initially, hold for 4 min, increased by 10 C/min to 190°C, then 30°C/min to 225°C

#### *Tobacco specific nitrosamines*

The four nitrosamines to be quantified were N′-nitrosoanabasine, N′-nitrosoanatabine, 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone, and N′-nitrosonornicotine. The samples were collected using Pallflex TX40HI20 Teflon coated fiber filters (Hammond et al., 1987). Filters are extracted by sonication in methanol, followed by evaporation to 0.5 mL. A Hewlett Packard 7890 Gas Chromatograph equipped with a Nitrogen Phosphorus detector was used to perform the analysis. The column used was an Agilent Technologies part #123-5012E, DB-5MS fused silica capillary column with the following specifications: length 15 m, diameter 320 µm, film thickness 0.25 µm. The inlet temp was 300°C. The oven conditions were 80°C initially, increased by 15°C/min to 140°C.

#### *Glycols (DEG and PG)*

Samples were collected on XAD-4 impregnated Pallflex 2500QAT Quartz fiber filters in phase I, and on XAD-4 impregnated Pallflex TX40HI20 Teflon coated fiber filters in phase II (Lewtas et al., 2001). The filters were extracted by sonication in methanol, followed by evaporation to 0.5 mL. A Hewlett Packard 6890 gas Chromatograph equipped with a 5972 Mass Selective detector was used to perform the analysis. The column used was an Agilent Technologies part #19091X-133, DB-WAX fused silica capillary column with the following specifications: length 30 m, diameter 250 µm, film thickness 0.25 µm. The inlet temperature was 250°C. The oven conditions were 70°C initially, hold for 2 min, increased by 10°C/min to 220°C.

## Results

The values of the pollutant concentrations for the e-liquid vapor samples and the cigarette smoke samples are presented in the Table 2 and in more detail in the supplemental material (Tables S1–S6).

For all of the samples, average VOC concentrations measured during phases I and II were below the limit of detection with limited exceptions. Ethylbenzene, benzene, toluene, and m/p xylenes (BTEX) were above detection limits. Their measured concentrations were orders of magnitude higher in tobacco smoke relative to the e-liquid vapor. The latter 3 compounds were measured by Schripp et al. (2012) and the results were comparable. For most carbonyls, concentrations were found to be low for both phases I and II for samples A-D, with some exceptions, such as acetone, formaldehyde, and acetaldehyde. These 3 carbonyls, however, were orders of magnitude higher in tobacco smoke relative to e-liquid vapor. Findings

Table 2. Summary of the average concentrations (ng/L) of sampled pollutant during phase I and II.

| | Vapor Sample A | | Vapor Sample B | | Vapor Sample C | | Vapor Sample D | | Blank E | | Cigarette Smoke F | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Phase I | Phase II | Phase I | Phase II | Phase I | Phase II | Phase I | Phase II | Phase I | Phase II | Phase I | Phase II |
| VOCs | 18.0 | 139.2 | 76.0 | 178.7 | 115.5 | 137.7 | 317.5 | 45.7 | 112.0 | 64.0 | 3566.3 | 6185.3 |
| Carbonyls | 797.7 | 345.0 | 1112.0 | 376.3 | 809.3 | 357.5 | 973.7 | 360.5 | 1648.8 | 327.4 | 31865.2 | 11357.3 |
| PAHs | 4.25 | 1.83 | 0.30 | 0.93 | 3.05 | 0.55 | 0.18 | 0.75 | N/F | 0.65 | 2.69 | 2.67 |
| Nicotine | 905 | 1705 | 725 | 2144 | 538 | 8770 | 6794 | 5904 | N/F | N/F | 5039 | 48050 |
| TSNAs | N/F | | 18 | | 18 | | 15 | | | | 121 | |
| PG | 2668 | 2254 | 37,785 | 56,133 | 120,000 | 54,993 | 77,390 | 88,365 | 1339 | 196 | 3,185 | 260 |
| DEG | N/F | N/F | 3 | N/F | 511 | N/F | 143 | N/F | 16 | N/F | 13 | N/F |

See Tables S1–S6 in the supplemental sections for additional information on specific pollutants, measured concentrations, and limits of detection (LOD).

are consistent with Schripp et al. (2012) and Lauterbach et al. (2012). Most PAHs were below the LOD for e-cigarette vapor but were above LOD for tobacco smoke. An anomaly was found with benzo(a)pyrene as it was found at similar levels in e-cigarette vapor, tobacco smoke, and the blank sample. Lautebach et al. (2012b) found contrasting results and noted benzo(a)pyrene was below their LOD for e-cigarette vapor but more than 40 times higher in tobacco cigarette smoke. Nicotine levels were also significantly higher in cigarette smoke than in the e-liquid vapor, typically by an order of magnitude or more. This result is corroborated by Laugesen et al. (2008), Lauterbach et al. (2012), and Trehy et al. (2011). Tobacco specific nitrosamines (N′-nitrosoanabasine, N′-nitrosoanatabine, 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone, and N′-nitrosonornicotine) quantified in e-cigarette vapor were also typically found at lower levels than tobacco smoke. The TSNA results for phase II were not included in the summary table because significant levels of TSNAs in the blank sample and atypically low levels of TSNAs in the cigarette smoke make this data set unreliable. Previous studies (Laugesen et al., 2008; FDA, 2009: Lauterbach et al., 2012) have shown levels of these TSNAs in e-cigarette vapor to be orders of magnitude lower than in tobacco cigarettes which is similar to our findings from phase I. DEG was detected in some samples, but below toxic levels as is corroborated by FDA (2009) and Lauterbach et al. (2012). The risk analysis of all the phase I and II measured pollutants is presented in the toxicology section.

Table 3 shows very low particle counts across all e-liquids tested. Figure 3 presents the average size distributions for all of the samples measured in the phase I experiments. Instrument problems with the WPS produced highly uncertain measurements for the phase II experiments and thus, they are not presented. The e-cigarette liquids include components like the glycols that can nucleate in the air to produce visible particles and provide the illusion of "smoke." Figure 3 shows at least two size modes are formed in the bag where there were essentially no pre-existing particles. It also shows that the particle number concentrations in the tobacco smoke are significantly higher than in the e-cigarette emissions (Figure 3). These results are in reasonable agreement with those of Schripp et al. (2012) where they diluted the emissions into a much higher volume resulting in modes with

Table 3. Total particle counts for phase I.

| Sample | Mean number concentration ± SD (p/cm³) | N (samples) |
|---|---|---|
| Vapor Sample A | 1795 ± 2315 | 79 |
| Vapor Sample A | 2015 ± 2361 | 79 |
| Vapor Sample A | 1654 ± 2067 | 79 |
| Vapor Sample B | 667 ± 1873 | 79 |
| Vapor Sample B | 635 ± 1800 | 79 |
| Vapor Sample B | 2115 ± 2329 | 79 |
| Vapor Sample C | 2119 ± 2378 | 79 |
| Vapor Sample C | 2287 ± 2472 | 79 |
| Vapor Sample C | 2963 ± 3122 | 79 |
| Vapor Sample D | 994 ± 2023 | 79 |
| Vapor Sample D | 2019 ± 2040 | 79 |
| Vapor Sample D | 2057 ± 2218 | 79 |
| Blank E | 28 ± 35 | 79 |
| Cigarette Smoke F | 21810 ± 55287 | 79 |
| Cigarette Smoke F | 21352 ± 50414 | 79 |
| Cigarette Smoke F | 19906 ± 48189 | 79 |

Phase II results are not presented due to complications with the WPS.

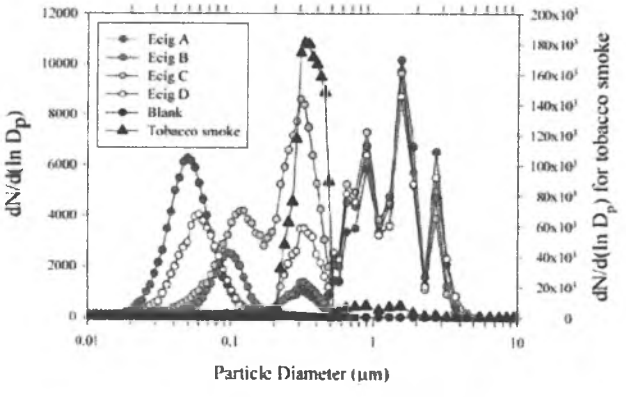


Figure 3. Overall particle number concentration (p/cm³) and size distribution data for all vapor and smoke samples collected in phase I.

different relative proportions. The Schripp et al. (2012) measurements were measurements of the size distribution after a smoker or e-cigarette user exhaled the aerosol and only measured particles <560 nm in diameter. These distributions are similar to those observed in the present

study. These measurements indicate that e-cigarettes do not contribute significant particulate matter mass to the indoor environment.

The cigarette smoke particle number concentration was an order of magnitude higher than the highest concentration of any e-liquid (2963 ± 3122, liquid C vs. 21,352 ± 50,414). Similar differences were found in Schripp et al. (2012). These results would be expected given the combustion of the tobacco.

### Toxicology

An expert toxicology consulting firm assessed the impacts of the measured concentrations on indoor air quality for all of the pollutants. Air quality data collected during both phases was provided to the toxicologist after being converted to estimated air concentrations using a well-mixed standard room size of 40 $m^3$. Indoor air quality analysis was conducted based on a dynamic system with estimated air changes per hour of 0.3. Risk analysis was conducted for all byproducts detected in vapor from e-liquids A-D, and cigarette smoke (F).

The Total Cumulative Hazard Indices (HIs) and Excess Lifetime Cancer Risks (ELCRs) values from the aforementioned Risk Analyses are presented in Supplemental Tables S7a and b & S8, respectively, for each vapor sample for e-liquids A-D and cigarette smoke (F) for phases I and II of the study. The HI and ELCR values were compared to acceptable Risk Limits of an HI of 1 for Non-Cancer Risks and an ELCR Risk Limit of $1 \times 10^{-5}$ for Cancer Risks. In addition, based on individual Hazard Quotients and ELCRs, the percentage risk contributions by the individual analytes were calculated to identify either individual chemical or chemical class risk drivers and the results are presented in Supplemental Tables S7a and b and S8.

Based on the exposure assumptions listed in Tables S7a and b and S8 for child and adult subchronic, chronic, and lifetime inhalation exposures to the atmospheric concentrations of Non-Cancer and Cancer analytes detected in vapor from e-liquids A-D and cigarette smoke (F), for phases I and II of the study, the Non-Cancer Risk findings (Table S7a and b) for both subchronic and chronic exposures, revealed a condition of "No Significant Risk" of harm to human health for vapor from e-liquids A-D (i.e. no HI value >1). For the cigarette smoke, (F), phase I results, the child subchronic and chronic inhalation exposure HIs markedly exceeded the HI Risk Limit of 1 (i.e. HIs = 2 and 10, respectively). In addition, the HI value of 5 for adult chronic exposures to cigarette smoke (F) in phase I of the study also indicated a condition of "Significant Risk" of harm to human health via the inhalation route of exposure, as did the HI value of 2 for the cigarette smoke (F), phase II for chronic child exposures. It is important to note that the key risk drivers for subchronic exposures were acrolein, methacrolein and propionaldehyde and for chronic exposures, acrolein and methacrolein. In the case of acrolein and methacrolein, some degree of uncertainty may be associated with this finding, since acrolein was used as the surrogate for the methacrolein inhalation RfCs.

For child and adult exposures to carcinogens in vapor from liquids A-D and cigarette smoke (F) (Table S8) no Cumulative ELCR exceeded the Cancer Risk Limit of $1 \times 10^{-5}$, with ELCRs ranging from $1 \times 10^{-7}$ to $9 \times 10^{-10}$, however for F (cigarette smoke), for phase I and phase II ELCRs adult exposures approached the ELCR risk limit of $1 \times 10^{-5}$ (i.e. ELCRs of $7 \times 10^{-6}$ and $1 \times 10^{-6}$, respectively). In each instance the primary risk driver was acetaldehyde. However, based on the overall findings, neither vapor from e-liquids A–D, or cigarette smoke (F) analytes posed a condition of "Significant Risk" of harm to human health via the inhalation route of exposure.

## Discussion

Electronic cigarettes have earned considerable attention by local, state, and federal agencies over the last few years. Many legislators have issued warnings and/or proposed bans to prohibit the use of e-cigarettes in public places. In July 2009, the Food and Drug Administration (USFDA, 2009), issued a report (http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm173401.htm) voicing several concerns, such as potential for youth addiction and possible toxicity of e-liquid. The FDA issued this report without any evidence of youth use of e-cigarettes or health impacts from the use of or exposure to emissions from an e-cigarette. In this study emissions from e-cigarette use and tobacco cigarette use were analyzed to measure levels of the chosen pollutants. Analysis of the pollutant concentrations showed that the e-cigarette vapor was found to pose significantly lower risk than cigarette smoke under the same testing conditions. Since there is no combustion with e-cigarette use, as opposed to cigarette smoking, particle counts resulting from vapor production were expected to be low as found during phase I (Table 3). These results are uncertain since they could not be replicated in phase II due to instrumental problems. For the cigarette smoke, particle concentrations were an order of magnitude higher than concentrations found for the vapor samples as shown above (Table 2). These results are similar to those of Schripp et al. (2012) and tobacco cigarette smoke particle distributions in Li and Hopke (1993).

Total air emission concentrations for many pollutants were found to be very low. The toxicology data shown in supplemental material (Tables S7a and b and S8) provides scientific evidence that for all pollutants sampled during this study, the endpoints of concern for assessing overall risk revealed no discernible health impacts from exposures to the vapor produced by any e-liquid used in this study. ELCR values for mainstream cigarette smoke samples were fairly low. The authors believe that this was because the measurements did not include side stream smoke in the testing environment. This lack of ETS should be taken into account for levels of all compounds measured in cigarette smoke

in this study with respect to indoor air quality. All risk analysis findings are based on a standard room size of 40 $m^3$ taking into account dispersion of the pollutants and a well-mixed environment. There is no prior research that compares actual emissions data collected with an assessment of potential exposures. These findings assess only the actual emissions measured and associated risk analysis impacts, not potential adverse health impacts related to e-cigarette use.

To date, no study on e-cigarettes suggests a potential risk to bystanders of e-cigarette users. A recent study by Flouris et al. (2012) concluded that acute active and passive vaping of e-cigarettes did not influence complete blood count (CBC) indices in smokers and never smokers, respectively. In contrast, acute active and passive tobacco cigarette smoking increased the secondary proteins of acute inflammatory load for at least 1 h.

Some weaknesses of this study include not changing the tubes in consideration of the possibility of glycol adherence to Teflon tubes used for sample collection during phase I of the experiment and the WPS error during phase II of the experiment. Difficulty obtaining IRB approval in 2009 for human subject trials using previously unstudied products made use of a smoking machine necessary to conduct this study. As a result, data did not reflect real world use of e-cigarettes, where the human user is an intermediary between the vapor and the environment.

There are a number of possibilities for future research. As a result of a large data gap as to what chemical compounds and/or pollutants found in tobacco smoke are also found in vapor produced by e-cigarettes, this study was designed to assess similarities and differences between tobacco smoke and e-cigarette vapor. Constituents were then assessed based on their overall risk for potential health impacts based on measured concentrations during phase I and II. Future studies should include repeating the experiment with other flavors of e-liquid (including flavorless) to determine whether flavoring in e-liquid plays a part in levels of various pollutants, varied voltage e-cigarettes to investigate whether increased heat initiates pyrolysis or decomposition that increases the toxicity, various types of cartridges and atomizers to determine whether cartomizer filler (polyfil) affects levels of tested compounds, and additional brands of e-liquid to assess emissions from a greater variety of e-liquids. It may also be beneficial to repeat the current study using a multi-cigarette version of the smoking machine to see if higher concentrations of vapor may affect toxicity. Tobacco cigarettes produce side stream smoke continuously, but there is minimal side stream vapor with e-cigarette use. Therefore, it would be helpful to repeat the experiment with human subjects smoking or using the e-cigarette inside the testing environment for inclusion of side stream smoke for comparison to real world environment. This would also help determine the extent to which vapor components may be absorbed by the e-cigarette user, rather than being released into the ambient air (see Vansickel & Eissenberg, 2012).

## Conclusions

The current study indicates that there are very low indoor air quality impacts from the use of an electronic cigarette based on the risk screening of measured emissions. It also indicates no apparent risk to human health from e-cigarette emissions based on the compounds analyzed. The authors recognize that future research assessing exposures to bystanders and users will be imperative for fully understanding the impacts from use of an electronic cigarette.

## Acknowledgments

The authors would like to recognize that this research would not have been possible without many contributions made by key individuals who brought additional expertise to this research. They would like to thank Peter W. Woodman, Ph.D. for the toxicological risk analysis, Mary Bielaska, Esq. for her legal counseling, Murray Laugesen, FNZCPHM for his suggestions on methodology, Yolanda Villa, Esq. for her consulting support, Janet Andersen for her administrative support, Vicki Vasconcellos and others listed at www.IVAQS.com for their financial support as well as hundreds of National Vapers Club supporters who provided individual financial contributions.

## Declaration of interest

National Vapers Club (NVC) has spent more than 3 years educating people about electronic cigarettes. This research was necessary to have more thorough information to present to scientific and political bodies who are struggling with regulation of a new product about which there is very little published scientific data. Funding was obtained by fundraising events held by NVC as well as individual donations by NVC members, and in part by e-cigarette retailers who contacted NVC to offer contributions. Although NVC funded this study, it had no control over the results. The scientists and independent contractors hired by the principal investigator were entirely responsible for collecting, analyzing and interpreting the data. Prior to data collection, no author or independent contractor who worked on this project had any financial interest in the outcome of this study. Subsequent to data collection, S. Babaian became part owner in a retail e-cigarette company.

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## Robert Ervine

**From:** jajmemjl@alaska.net
**Sent:** Tuesday, March 25, 2014 11:31 AM
**To:** Rep. Lindsey Holmes
**Subject:** smoke free workplace

My name is Janice Nightingale and I live in Senator Mike Chenault's district.

I just wanted to call and say I was very happy to find out that a statewide smoke-free workplace bill has finally been introduced this session. I support this bill because it will protect all Alaskan workers from the dangers of secondhand smoke while indoors. I hope Senator Mike Chenault will support it.
I also wanted to emphasize my support for the inclusion of e-cigarettes in the law.
We can all agree that little is known about these new products. I don't want to risk exposing myself or my family and friends to the unknown dangers of these devices. E-cigarettes are very inconsistently regulated and we need to make sure we're not setting another generation up for cancer and other health problems because the tobacco lobby spreads doubt.
This is the right thing for Alaska and Senator Mike Chenault's district, and I hope that he/she will support it.

Respectfully,

Janice Nightingale
PO Box 8131
Nikiski, AK 99635
jajmemil@alaska.net

**Robert Ervine**

**From:** Lauren Morgan <LMorgan@deltaleasing.com>
**Sent:** Tuesday, March 25, 2014 10:42 AM
**To:** Rep. Lindsey Holmes
**Subject:** HB360 - Please Include in Todays Committee Hearing

Representative Holmes,

I am writing today in support of HB360, which will protect all workers from the dangers of exposure to secondhand smoke in the workplace. I live in Anchorage where I am protected in the workplace, but 50% of the state IS NOT covered by a comprehensive smokefree workplace policy. Everyone deserves the right to breathe smokefree air! Also, thank you for including e-cigarettes, which we are only now researching and we are finding out that secondhand aerosol IS NOT simply harmless water vapor. Thank you.

**Lauren Morgan**

**Office**: 907.771.1300

**Cell**: 907.252.5185

**Fax**: 907.771.1380

**E-mail**: *lmorgan@deltaleasing.com*

DELTA LEASING LLC

**Robert Ervine**

**To:** Julie Morris
**Subject:** RE: Public Testimony on HB360

Good morning, Representative Lindsey Holmes.

My name is Melany Derit and I live in Sterling, AK.

I just wanted to let you know that I was very happy to find out that a statewide smoke-free workplace bill has finally been introduced this session. I support this bill because it will protect all Alaskan workers from the dangers of secondhand smoke while indoors. I hope you will support it.

I also wanted to emphasize my support for the inclusion of e-cigarettes in the law. We can all agree that little is known about these new products. I do not want to risk exposing myself or my family and friends to the unknown dangers of these devices. E-cigarettes are very inconsistently regulated and we need to make sure we are not setting another generation up for cancer and other health problems because the tobacco lobby spreads doubt.

This, I believe, is the right thing for Alaska and I hope you will support it.

Thank you,

Melany Derit
Sterling, AK

## Jordyn Grant

**From:** Grace Olendorff <grace_olendorff@hotmail.com>
**Sent:** Tuesday, March 25, 2014 12:13 PM
**To:** Rep. Lindsey Holmes
**Subject:** HB360

I am writing today in support of HB360, which will protect all workers from the dangers of exposure to secondhand smoke in the workplace. I live in Anchorage where I am protected in the workplace, but 50% of the state IS NOT covered by a comprehensive smokefree workplace policy. Everyone deserves the right to breathe smokefree air!

PLEASE support public health by supporting HB360!

Grace



Are you a fashion victim? These heels might just do you in

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# Leonard Gilroy: E-cigarette regulations likely to do more harm



By LEONARD GILROY / For the Register

**RESEARCH**

In the United Kingdom, University of Stirling Professor Gerard Hastings, co-author of a recent Cancer Research UK report on e-cigarettes, said, "E-cigarettes and other alternative nicotine delivery devices are probably much safer than conventional cigarettes, and so if smokers switch to them many lives could be saved."

**Regulations in Southern California, and across the nation, to limit the use and sale of electronic cigarettes are spreading rapidly. But like so many well-intentioned policies, these e-cigarette regulations are far more likely to harm public health and anti-smoking efforts than benefit them.**

Officials in Los Angeles and Long Beach, along with places like New York City and Chicago, are considering new ordinances to add e-cigarettes to public smoking bans, something officials in Lakewood, Richmond and other California communities have already enacted.

Southern California cities like Seal Beach, Bellflower, Cerritos, Norwalk, Duarte and Alhambra have all enacted moratoria this year preventing new e-cigarette retailers from opening within their borders. The California Legislature considered a bill to add e-cigarettes to the statewide smoking ban earlier this year, a proposal that is likely to return next year.

Rationales for regulatory actions vary, but often revolve around misplaced fears that e-cigarettes will serve as a gateway to the use of conventional cigarettes by kids and non-smokers, as well as misperceptions that e-cigarette vapor is as harmful as cigarettes.



Older residents among those irked by wait for concealed-gun permits

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Both fears are unsupported by evidence. Regarding the "gateway" theory, the Register noted last month that a University of Oklahoma study found that only 43 out of 1,300 college students (3.3 percent) reported that e-cigarettes were the first form of nicotine they'd tried, with only one student later taking up regular cigarette smoking.

And there is growing evidence that e-cigarettes have nearly none of the harmful properties of conventional cigarettes, primarily because nothing is burned in "vaping," so it doesn't produce the cancer-causing toxins and multitude of chemicals that result from the combustion of tobacco. A study released by Drexel University's School of Public Health this fall found no evidence that e-cigarettes expose users or bystanders to levels of contaminants that would warrant health concerns.

This helps to explain why public health experts are increasingly endorsing e-cigarettes as a solid alternative to smoking and recommending against policies to limit their sale or use. Former U.S. Surgeon General Richard Carmona echoed a similar sentiment in testimony recently submitted to New York's City Council. Carmona urged officials to resist the "well-intentioned but scientifically un-supported effort" to include e-cigarettes in the city's smoking ban, which would "constitute a giant step backward in the effort to defeat tobacco smoking" and "send the unintended message to smokers that electronic cigarettes are as dangerous as [traditional cigarettes], with the result that many will simply continue to smoke their current toxic products."

Southern California has been a hotbed of regulations aimed at stifling e-cigarette sales and use. It's time to take a different approach. If the goal is to minimize smoking-related illnesses and diseases, then California policymakers should reject counterproductive policies and preserve the ability of smokers to seek safer nicotine delivery alternatives like e-cigarettes that minimize harm to themselves and others.

*Leonard Gilroy is the director of government reform at Reason Foundation.*

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statement by

**Joel L. Nitzkin, MD, MPH, DPA**

with extensive background material and annotated bibliography

in opposition to SB 648 – a bill to extend bans on smoking to include use of e-cigarettes

California Assembly Governmental Org. Committee, August 14, 2013

Joel L. Nitzkin, MD, MPH, DPA
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Past Co-Chair, Tobacco Control Task Force
American Association of Public Health Physicians
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## Verbal Presentation:

My name is Joel Nitzkin.

I am a public health physician. I have been a local health director, a state health director and President of two national public health organizations. I have been in the private practice of public health as a policy consultant since the mid-1990's. The views I am expressing today are entirely my own, and not on behalf of any third party.

I am here to speak against SB 648. This bill would prohibit e-cigarette use in areas where smoking is banned. My opposition is based on two observations: 1) exhaled e-cigarette vapor presents no threat to non-users that would justify such a ban; and 2) misrepresenting e-cigarettes as harmful as cigarettes is both factually incorrect and damaging to the health of the public.

The e-cigarette is one of a number of smoke-free tobacco/nicotine alternatives to the cigarette that can reduce the risk of tobacco-attributable illness and death by 98% or better, while satisfying the user's urge for nicotine.

There is now a substantial and convincing body of research findings confirming these impressions.

Misrepresenting e-cigarettes has the practical effect of reinforcing real tobacco cigarettes as the dominant product for nicotine consumption. It does nothing to reduce teen initiation of tobacco/nicotine products and protects cigarettes from competition from these far less hazardous products.

The cigarette is the most hazardous and most addictive of tobacco products, and the product most attractive to teens. There was no pandemic of tobacco-related addiction, illness and death until the advent of the machine-made cigarette. The smoke-free alternatives, including the chewing tobacco, snus, e-cigarette and other products on the American market pose a risk of tobacco-attributable illness and death less than 2% the risk posed by cigarettes. In addition, available evidence strongly suggests that they are far less attractive to teens. Two recently published studies, conducted by public health non-profits, one in the USA, and one in Great Britain, showed that teens were very aware of e-cigarettes, yet it was impossible to find even a single non-smoking teen that had taken them up.

For most of the past half-century, the cigarette was so dominant a tobacco product in the USA that anti-smoking advocates got into the habit of using the terms "cigarette" and "tobacco" as if they were synonymous. Working from the seemingly reasonable but demonstrably untrue premise that all tobacco products were equally hazardous, and on the premise that tobacco companies are evil, the anti-smoking advocates adopted the policy that blocking the introduction of any new tobacco product would protect the health of the public.

Times have changed.

We now know about the huge differences in risk, comparing different classes of tobacco products.

We now know more about the attractiveness of different classes of tobacco products to non-smoking teens.

We even know more about the fact that, for a large number of mental health patients, nicotine is seen as a highly beneficial drug.

None of these new findings could be imagined by most anti-tobacco activists, even a few years ago. As far as they are concerned, the science is settled, and all tobacco/nicotine products are to be equally condemned. Any new scientific findings that conflict with these views are routinely dismissed as tobacco company propaganda.

The possibility now exists to rapidly and dramatically reduce tobacco-attributable addiction, illness and death. Successfully doing so will require honest communication to current smokers as to the differences in risk posed by different types of tobacco products, continuing prohibition of sales of all tobacco products to minors, and effective federal regulation of the manufacture and marketing of tobacco products.

Given the attractiveness of e-cigarettes to current smokers and lack of attractiveness to current non-smokers, the possibility exists to harness natural market forces, in combination with regulatory oversight, to reduce tobacco-related addiction, illness and death.

Yes, more research is certainly in order. Meanwhile protecting the health of the public is best done by implementing what we already know about the determinants of tobacco-related harm.

SB 648 is a step in the wrong direction. It will do more harm than good in terms of protecting the health of the public. I urge its defeat.

If the nicotine and trace carcinogens in e-cigarette vapor presented any significant hazard to bystanders, those advocating for this legislation could have and should have included pharmaceutical nicotine inhalers in this ban. The fact that they have not done so strongly suggests a perception on their part that no such hazard exists.

This statement is supplemented with a written handout that includes much more detail as to who I am and why I am here, plus a brief annotated bibliography to back up statements made in this presentation.

One of the problems in coming in from out of state and not being immersed in the California policy milieu is not being sure which issues are uppermost in the mind of the legislators who will be voting on a particular bill. One issue, in particular I would welcome the opportunity to discuss, if it is of interest to the committee, is the issue of conflicts of interest. I would welcome the opportunity to discuss this or any other issues of concern on this bill, not otherwise addressed in this presentation.

Thank you.

## Introduction to Dr. Nitzkin and Disclaimer

I have been involved with tobacco control since the late 1970's. From early 2007 through mid-2010, I served as Co-chair of the Tobacco Control Task Force of the American Association of Public Health Physicians. During that period, when the Tobacco Control Act was making its way through Congress, I, and my AAPHP colleagues decided to do our own independent literature review to determine the best way for the USA to reduce tobacco-attributable addiction, illness and death. It was that literature review that drew our attention to tobacco harm reduction as the most promising of public health interventions, and to e-cigarettes as possibly the most promising of tobacco harm reduction modalities.

The views I am expressing today are entirely my own, they do not reflect position statements formally adopted by AAPHP, R Street or any other organization I am affiliated with. Neither I nor AAPHP have ever received any direct or indirect financial support from any tobacco, e-cigarette or pharmaceutical enterprise. My travel here, today, is supported by the R Street Institute, a Washington-DC based libertarian think tank that respects the role of government in regulating industry to protect health and the environment, but strongly opposes undue governmental interference with market forces. R Street designated tobacco harm reduction as one of their priority issues after FDA attempted to remove e-cigarettes from the market by declaring them to be an unapproved drug-device combination subject to the provisions of the drug law. R Street policy and decision-making is independent from governmental, tobacco, e-cigarette or pharmaceutical industry influence.

## What is Environmental Tobacco Smoke, and how does it harm people?

Environmental tobacco smoke is a witch's brew of toxic chemical substances from the incomplete combustion of tobacco. The main component is Carbon Monoxide, but it also includes other gasses and tarry particulate residue containing most of the nicotine and the worst of the carcinogens. About 85% of environmental tobacco smoke is side-stream smoke- the smoke that curls off the end of the cigarette when no-one is puffing on it. The mainstream smoke exhaled by the smoker includes only what is left after much of what was inhaled is absorbed by the smoker.

## E Cigarette vapor – inhaled, exhaled and "sidestream"

E-cigarette vapor, as inhaled by the users is mainly water, propylene glycol and glycerin, with small amounts of nicotine and flavoring. There is no Carbon Monoxide, no tar, and no products of combustion. There is no side-stream smoke or vapor. None. Propylene glycol and glycerin are generally recognized as safe. Propylene glycol has been used as the propellant in asthma inhalers and is the main ingredient in theatrical fog.

## Why the objections to e-cigarettes from public health advocates?

Objections to e-cigarettes from public health advocates are theoretical in nature, based on a distrust of all non-pharmaceutical tobacco-related companies and the false premise that we do not know what e-cigarettes contain. We actually know more about e-cigarette liquid and vapor than we do about the chemical make-up of cigarette smoke.

Those opposing e-cigarettes are quick to point out that they have not been approved by FDA.

This is true.

Mainstream smoke, in ETS, is the smoke exhaled by the smoker. Sidestream smoke is the smoke that curls off the end of the cigarette when no-one is inhaling the cigarette. The smoke consists of more than 4,000 different chemicals, 30 to 60 of which are known carcinogens. Solid particles make up about 10% of the smoke, including the tar and most of the nicotine. The major gas present is carbon monoxide. About 85% of the ETS in a room comes from side-stream smoke. ETS increases the risk of lung cancer, other cancers, heart and lung disease, increases the risk of low birth weight and is suspected as increasing the risk of birth defects. All this is in addition to the known irritation of eyes, throat and respiratory mucous membranes.

www.ccohs.ca OSH Answers, Environmental Tobacco Smoke.

2006 Report of the Surgeon General The Health Consequences of Involuntary Exposure to Tobacco Smoke

California Environmental Protection Agency Fact Sheet: Environmental Tobacco Smoke: A Toxic Air Contaminant

*JLN note: There is general consensus that environmental tobacco smoke is highly toxic and a major cause of potentially fatal illness. CDC (USDHHS Centers for Disease Control and Prevention) estimates that approximately 394,000 American smokers die each year from smoking plus an estimated 49,000 non-smokers die in the USA from exposure to environmental tobacco smoke.* http://www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/tobacco_related_mortality/index.htm

## Step-down in Risk from Cigarette Smoking to E-Cigarette Vapor

1. The 443,000 tobacco related deaths in Americans each year, per CDC estimates, as noted above, are all from cigarette use. The numbers of deaths from all other forms to tobacco, combined, are so small and so hard to estimate that they are not estimated or tracked by CDC authorities. http://www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/tobacco_related_mortality/index.htm

2. The smokeless tobacco products that have been on the American market since at least the 1980's are estimated to pose a risk of potentially fatal illness less than 2% the risk posed by cigarettes. Thus, contrary to common perception, different tobacco products present dramatically different risks of potentially fatal illness.

   Rodu B: The scientific foundation for tobacco harm reduction, 2006-2011. Harm Reduction Journal 8:19 2011. www.harmreductionjournal.com/content/8/1/19

3. E-cigarette vapor, consisting entirely of the vapor exhaled by the e-cigarette user, will, almost assuredly pose less of a risk to bystanders than the risk posed to the e-cigarette user – a risk too small to justify restrictions on environmental e-cigarette vapor. It is important to note that, despite the lack of long term studies to verify this perception, it is generally agreed that long term use of the pharmaceutical nicotine replacement therapy products (Nicorette, Commit, and others) pose no risk of tobacco-attributable mortality.
   Burstyn I: Peering through the mist: What does the chemistry of contaminants in electronic cigarettes tell us about health risks? http://publichealth.drexel.edu/SiteData/docs/ms08/f90349264250e603/ms08.pdf August 2013.

   a. "For all byproducts measured, electronic cigarettes produce very small exposures relative to tobacco cigarettes. The study indicates no apparent risk to human health from e-cigarette emissions based on the compounds analyzed." McAuley TR et al: Comparison of the effects of e-cigarette vapor and cigarette smoke on indoor air quality. Inhal Toxicol 24(12) 850-857 2012.

b. Nitrosamine levels for e-cigarettes were similar to the levels in Nicorette gum and NicoDerm patches, but less than 100th to 1,000th the level in a wide range of smokeless tobacco and cigarette products. Cahn & Siegel, J Public Health Policy 2011.

c. Passive vaping, compared to cigarette environmental tobacco smoke: Total organic carbon in the test chamber after 5 hours of smoking or vaping, showed no detectable levels of acrolein, toluene, xylene and PAHs for the e-cigarettes, compared to high levels in the cigarette chamber. Romagna, Farsalinos et al SRNT Europe 2012.

d. Anti-smoking researcher (Glantz) misleads public with invalid comparison of e-cigs and nicotine inhaler; correct analysis shows that nicotine inhalers have higher amounts of six carcinogens, including five to ten times the amount of three heavy metals. This re-analysis is based on a comparison of user exposure to anticipated daily doses of e-cigarette vapor compared to nicotine inhalers, rather than comparison of amounts of carcinogen in single cartridges. Siegel M: www.tobaccoanalysis.blogspot.com/2013/07/anti-smoking-researcher-misleads-public.html . July, 2013

e. In tests comparing the effects of e-cigarette vapor to cigarette smoke on cell cultures of myocardial cells, the vapor had minimal impact on the cells, while the smoke killed almost all of them. Farsalinos et al, TMA 2013.

## Attractiveness of E-cigarettes to Teens and other Non-smokers

Dr. Jonathan Winickoff is Chairman of the American Academy of Pediatrics' Tobacco Consortium. In an article posted online in the Journal of Environmental and Public Health, Dr. Winickoff co-authored a report of a national survey of 3,240 adults (age 18 and above), including 1,802 non-smokers. They were only able to find 6(six) nonsmokers who had ever used e-cigarettes. Siegel M: Blogpost May 2013 http://tobaccoanalysis.blogspot.com/2013/05/national-study-of-adults-can-find-only.html. McMillen R et al: Use of Emerging Tobacco Products in the United States. Journal of Environmental and Public Health 2012 Article ID 989474 www.hindawi.com/journals/jeph/2012/989474/

In a second study that blows out of the water the anti-smoking groups' contention that electronic cigarettes appeal to nonsmokers, especially youth, and will lead to increased smoking, Action on Smoking and Health (ASH-UK) was unable to find a single nonsmoker in Great Britain - either youth or adult - who regularly uses electronic cigarettes. The study, released this week, involved a survey of 12,171 adults and 2,178 children ages 11-18 in February and March of this year. Despite widespread awareness of electronic cigarettes among youth and adults, the survey failed to find a single adult or youth never smoker who regularly uses electronic cigarettes. Awareness of electronic cigarettes was 67% among 11-18 year-olds and 83% among the 16-18 year-olds. Nevertheless, "among young people who have never smoked ... 0% report continued e-cigarette use and 0% expect to try an e-cigarette soon." The study reports that: "Among adults, electronic cigarette current use ... remains at 0% among those who have never smoked." Siegel, M Blogpost dated May 2013: http://tobaccoanalysis.blogspot.com/2013/05/uk-study-fails-to-find-single-nonsmoker.html. ASH/UK Factsheet dated May 2013: www.ash.org/uk/files/documents.ash.891.pdf

*JLN Note: Even with unregulated marketing of e-cigarettes without the warnings required on other smokeless tobacco products, almost no non-smokers were attracted to e-cigarette use in these surveys conducted by anti-smoking advocates. This strongly suggests that e-cigarettes are simply not attractive to teens and other non-smokers and that it should be possible to market*

***these products to smokers without fear that large numbers of teen and other non-smokers who would not have initiated tobacco use would do so in response to such marketing.***

## Consumption of Cigarettes by Mental Health Patients

**Adults who suffer from depression are twice as likely to smoke and also smoke more heavily than adults not depressed per a survey from the National Center for Health Statistics, May 2013.** www.physorg.com/print190471659.html

**Persons with a mental disorder in the month prior to this national comorbidity survey consumed approximately 44.3% of the cigarettes smoked by this nationally representative sample. Lasser K et al Smoking and mental illness: A population-based prevalence study. JAMA 2000; 284:2606-2610.**

***JLN note: anecdotal reports indicate that depressed patients and those with bipolar disorder and/or schizophrenia find nicotine to be a highly beneficial drug that enables them to get through the day in emotional balance and with substantially less side effects that usually prescribed medications. The reports noted above and these anecdotal observations clearly indicate that nicotine is beneficial for a significant portion of the population, and that total elimination of self-prescribed nicotine, as desired by many anti-tobacco advocates would be harmful to these mental health patients.***

**Additional bibliographic references dealing with these and other issues are available on request from Dr. Nitzkin.**

The New York Times

December 6, 2013

# Two Cheers for E-Cigarettes

By JOE NOCERA

Imagine a product — a legal but lethal one — that kills 400,000 Americans a year. Public health advocates have been trying for decades to persuade Americans not to use it. The industry has been sued and sued again, but it is still operating profitably. One out of every five Americans is addicted to the product.

Now imagine that an alternative comes to the market, an innovative device that can help people wean themselves from the deadly product. It has the same look and feel as the lethal product; indeed, that's a large part of its appeal. It, too, is addictive. But the ingredients that kill people are absent.

This, of course, is no imaginary scenario. The lethal product is cigarettes, which use nicotine to addict and combustible tobacco to kill. And the alternative is electronic cigarettes, which deliver nicotine without the tobacco, and emit a vapor that almost instantly evaporates. Yes, users can be hooked on nicotine, which is a stimulant. But people who "vape" are not going to die, at least not from inhaling their cigarette.

You'd think that the public health community would be cheering at the introduction of electronic cigarettes. We all know how hard it is to quit smoking. We also know that nicotine replacement therapies, like the patch, haven't worked especially well. The electronic cigarette is the first harm-reduction product to gain serious traction among American smokers.

Yet the public health community is not cheering. Far from it: groups like the American Lung Association, the American Heart Association and the Campaign for Tobacco-Free Kids are united in their opposition to e-cigarettes. They want to see them stigmatized — like tobacco cigarettes. They want to see them regulated like cigarettes, too, which essentially means limited marketing and a ban on their use wherever tobacco cigarettes are banned.

Thomas Farley, New York City's health commissioner, trotted out most of the rationales against e-cigarettes the other day at a City Council hearing. (The City Council is considering a bill, strongly supported by the Bloomberg administration, that would forbid the use of an e -cigarette anywhere that cigarettes are banned.) E-cigarettes, he said, "are so new we know

very little about them." Thanks to e-cigarettes, smoking is becoming glamorous again, and could become socially acceptable. The number of high school students who have tried electronic cigarettes doubled from 2011 to 2012. He made a particular point of showing how closely e-cigarettes resembled old-fashioned tobacco cigarettes.

The reason to fear this resemblance, say opponents of electronic cigarettes, is that "vaping" could wind up acting as a gateway to smoking. Yet, so far, the evidence suggests just the opposite. Several recent studies have strongly suggested that the majority of e-cigarette users are people who are trying to quit their tobacco habit. The number of people who have done the opposite — gone from e-cigarettes to cigarettes — is minuscule. "What the data is showing is that virtually all the experimentation with e-cigarettes is happening among people who are already smokers," says Michael Siegel, a professor at the Boston University School of Health.

Siegel is a fierce critic of tobacco companies, but he's also not afraid to criticize the anti-tobacco advocates when they stretch the truth. When we got to talking about the opposition to e-cigarettes in the public health community, he said, "The antismoking movement is so opposed to the idea of smoking it has transcended the science, and become a moral crusade. I think there is an ideological mind-set in which anything that looks like smoking is bad. That mind-set has trounced the science."

Another person who considers e-cigarettes promising is David Abrams, the executive director of the Schroeder Institute for Tobacco Research and Policy Studies. "It's a disruptive technology," he said, "that might give cigarettes a run for their money." In his view, the anti-tobacco advocates had spent so many years arguing from "a total abstinence framework," that they haven't been able to move from that position. Yet, he noted, the country has long tolerated many similar harm reduction strategies, including needle exchanges and methadone maintenance.

None of this is to say that electronic cigarettes should be free of regulation. But they should be regulated for what they are — a pharmaceutical product that delivers nicotine, not a conduit for tobacco poison. Let them make health claims — which they can't now do — so long as they are backed up with real science. And, most of all, use e-cigarettes to help make "real" cigarettes obsolete.

At that recent New York City Council meeting, one of the fiercest critics to testify was Kevin O'Flaherty of the Campaign for Tobacco-Free Kids. "If it walks like a duck and it talks like a duck and it sounds like a duck and it looks like a duck, it is a duck," he said.

Is this what passes for science when you oppose electronic cigarettes?

RICHARD H. CARMONA, M.D., M.P.H., FACS
17th Surgeon General of the United States (2002-2006)

The Honorable Bernard Parks
District 8
200 N. Spring St., Room 460
Los Angeles, CA 90012

Dear Councilmember Parks:

My name is Richard Carmona, and I served as the 17th Surgeon General of the United States. I write to ask for your personal support in *declining* to include electronic cigarettes in the City's smoking ban, which would prohibit their use wherever combustible tobacco cigarettes are prohibited. I am extremely concerned, as set forth below, that such an effort, if successful, could do tremendous harm to what is emerging as the most promising weapon yet in the fight against tobacco-related illness and death.

As we approach the 50th anniversary of the first Surgeon General's Report linking smoking and cancer, the plague of tobacco-caused death and disability still persists, killing over 430,000 Americans per year, while disabling millions more with preventable chronic diseases at a cost of hundreds of billions of dollars annually.

During my tenure as Surgeon General, my colleagues and I published reports detailing the preventable harm done by tobacco, spoke frequently to the public and to Congress about the catastrophic health damage caused by tobacco, and even participated as an expert witness in the federal government's case against the tobacco industry. I am particularly proud of my authorship of the 2006 Surgeon General's report on secondhand smoke, in which I wrote: "The debate is over. The science is clear: secondhand smoke is not a mere annoyance, but a serious health hazard that causes premature death and disease in children and non smoking adults."

Yet despite my actions and those of my predecessors like Surgeon General C. Everett Koop, high cigarette taxes, Food and Drug Administration (FDA)-approved smoking cessation therapies, and the best educational efforts by public health professionals, nearly 20% of the adult population and one-third of our military service members continue to smoke. The Centers for Disease Control (CDC) reports that adult smokers usually know they are engaged in harmful behavior and 69% would like to reduce or quit smoking. However, each year only 6% of smokers succeed in quitting, and new smokers replace those who successfully quit. The history and data suggest that we need more viable alternatives in this fight against tobacco.

I believe that one such alternative is the electronic cigarette. Despite their unfortunate name, electronic cigarettes are not actually cigarettes. They contain no tobacco but rather deliver nicotine without all of the toxic, carcinogenic, and other disease-causing products of tobacco combustion. (For example, they produce no carbon monoxide (a particularly



Vice Chairman
Canyon Ranch

Chief Executive Officer
Canyon Ranch Health

President
Canyon Ranch Institute

Distinguished Professor
Zuckerman College of Public Health
University of Arizona

lethal constituent of secondhand tobacco smoke) and produce no sidestream emissions (a source of 85% of secondhand tobacco smoke)). The published research suggests there may be a significant role for electronic cigarettes in tobacco harm reduction strategies, since they provide smokers both with the nicotine they crave and the smoking rituals that they have grown accustomed too. Respected Wall Street analysts have opined that, within a decade, electronic cigarette sales could overtake tobacco sales. I recently joined the board of NJOY, the leading independent electronic cigarette company, because its ambitions are even higher – to obsolete the tobacco cigarette entirely.

I recognize the good intentions behind the present effort to include electronic cigarettes in the City's smoking ban. However, I am extremely concerned that a well-intentioned but scientifically un-supported effort like the current proposal could constitute a giant step backward in the effort to defeat tobacco smoking. This regulation, if passed, would disincentivize smokers from switching to electronic cigarettes, since NJOY's research indicates that many initially switch for reasons of convenience. It would also send the unintended message to smokers that electronic cigarettes are as dangerous as tobacco smoking, with the result that many will simply continue to smoke their current toxic products. Legislative action that would keep smokers smoking would obviously have serious health consequences – and could cost lives. Worse still, it could lead to the adoption of similar ordinances in other cities, creating a domino effect that would further magnify the potential public health danger in this scientifically unsupported approach.

I will also observe that the concerns expressed about the possibilities that electronic cigarettes could addict non-smokers, condemning them to a lifetime struggle with nicotine addiction, echo concerns expressed about nicotine gums and patches when these first were introduced to the market. We have seen clearly, however, that such products did not have that affect. At the same time, while gums and patches have helped a small minority of smokers successfully quit smoking, it is clear to those of us have been engaged in this battle that we need more impactful solutions to the continuing problem of tobacco smoking, and that is where we see electronic cigarettes playing a central role.

I know that we all share the same vision of a world without tobacco related illness and disease. I fervently believe that to achieve that goal, we need to distinguish between the problem (tobacco smoking and tobacco secondhand smoke) and one extremely promising solution (electronic cigarettes). I strongly encourage you to resist calls to include electronic cigarettes in the City's smoking ban, which I believe would be a major step backward in the effort to achieve this aim. A decision rejecting this proposal would preserve the great legacy of this Council in the fight against tobacco.

Sincerely,

Richard Carmona

Richard Carmona, M.D., M.P.H. FACS
17th Surgeon General of the United States

Dear Chairmen and Members of the Committees for Health and Human Services and Public Health,

I am writing to you in my capacity as a consultant for the Electronic Cigarette Industry Group ("ECIG"). ECIG is a non-profit organization representing consumers, manufacturers, importers and distributors of electronic cigarettes. ECIG advocates for reasonable regulation of electronic cigarettes and supports laws that prevent minors from accessing them. I offer these comments in connection with the January 22, 2014 meeting for Senate Interim Studies 13-26 and 13-52 and House of Representatives Interim Study IS-13-083, all of which pertain to tobacco harm reduction and the appropriate regulation of electronic cigarettes and other alternatives to traditional tobacco products.

Before joining ECIG as a consultant, I was President and CEO of the American Lung Association. My efforts with the American Lung Association included securing passage of the landmark federal legislation that placed the tobacco industry under the regulation of the Food and Drug Administration. With the FDA now poised to regulate electronic cigarettes, it is important for state and federal regulators to acknowledge the important distinctions between e-cigarettes and traditional tobacco products.

A few recent proposals – such as Governor Fallin's executive order banning electronic cigarettes on public property and a failed 2013 bill that would have subjected electronic cigarettes to tobacco product requirements –illogically impose the same restrictions on e-cigarettes that govern combusted cigarettes. Such proposals are misguided in that they are not grounded in any evidence linking electronic cigarettes to the dangers posed by traditional cigarettes. Even worse, such proposals are likely contrary to public health by discouraging smokers from an alternative.

Perhaps like other emerging technologies, electronic cigarettes have become the subject of confusion and, in some instances, purposeful misinformation. For example, some people appear to believe that electronic cigarettes emit the same toxic byproducts as conventional cigarettes. Consequently, they have called for the same restrictions on electronic cigarettes. But electronic cigarettes are not the same – they do not involve combusted tobacco, which is widely recognized as the real danger from smoking, and they do not emit the same harmful second-hand smoke. Because electronic cigarettes are different, they require different regulations.

The emerging evidence provides a good understanding of electronic cigarettes and their byproducts. The primary ingredient is propylene glycol, which is a commonly-used preservative in many foods we eat. Recent research has shown that that any harm from electronic cigarettes is likely to be negligible, particularly when compared to traditional cigarettes. Stated differently, the question regarding electronic cigarettes is not whether there is evidence they may be harmful, but rather whether electronic cigarettes present similar risks to conventional cigarettes. There is no evidence that electronic cigarettes pose such risks.

I believe that regulating electronic cigarettes the same as traditional cigarettes would convey the false impression to smokers that electronic cigarettes are as dangerous as traditional cigarettes. If that happens, it would discourage what could be a beneficial alternative to

traditional cigarettes, an outcome that is not in the public interest. Electronic cigarettes have the potential to make combusted cigarettes obsolete, and regulators should shape policy to encourage, rather than discourage, these products as part of an overall tobacco harm reduction policy.

The Food and Drug Administration has drafted regulations governing electronic cigarettes, and it appears that these regulations will treat electronic cigarettes differently than traditional tobacco products. The Oklahoma legislature would be wise to wait for the FDA's findings, and then consider appropriate regulations. Until then, laws that equate electronic cigarettes with tobacco products are premature, and likely will damage a promising new alternative.

Sincerely,

Charles Connor
Past President
American Lung Association

VIEWPOINT

# Promise and Peril of e-Cigarettes
## Can Disruptive Technology Make Cigarettes Obsolete?

David B. Abrams, PhD
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Author Reading at jama.com

**Despite extraordinary success,** progress has stalled in reducing premature deaths from tobacco (primarily caused by cigarettes or other combusting tobacco products and not by nicotine per se). The dominance of cigarettes over the past 100 years (the cigarette century) threatens to persist for another century.

Two philosophies have dominated tobacco control: abstinence and harm reduction. Abstinence implies avoiding all tobacco use behavior because there is no safe tobacco or nicotine level. If avoidance is not practical or realistic, harm reduction sets a goal that minimizes the harm caused by the behavior. Tension between reduction and abstinence advocates can be divisive. The rapid rise in the use and popularity of e-cigarettes has substantially increased this tension because of their potential for harm reduction. Although still variable in quality, appeal, and efficient nicotine delivery, e-cigarettes represent an evolving frontier, filled with promise and peril for tobacco control practitioners, policy makers, and regulators.

This Viewpoint examines the promise, from a harm reduction perspective, and the peril, from an abstinence perspective—represented by e-cigarettes and asks the question "Do e-cigarettes represent a breakthrough disruptive technology, able to render the combustion of tobacco obsolete, potentially ending the combustion-related morbidity and mortality that has been characterized by the cigarette century?"

### The Advent of e-Cigarettes

Whether e-cigarettes deliver promise or peril depends on a complex dynamic interplay among the industries marketing e-cigarettes (independent makers and tobacco companies), consumers, regulators, policy makers, practitioners, scientists, and advocates. The public health standard for evaluating e-cigarettes is a critical yardstick because it considers both individual (safety and efficacy) and public health outcomes in terms of the likelihood of harms vs benefits to the population. Although there is insufficient scientific evidence to fully inform the standard, the increasing evidence to date points to an opportunity of a new class of safer, but very appealing, nicotine delivery technologies that could favor the speedy obsolescence of conventional cigarettes.[1-3]

The popularity of e-cigarettes is obvious. e-Cigarette revenues have doubled every year since 2008 and are projected to reach $2 billion in 2013.[4] Adult use among smokers doubled to 20% from 2010 to 2011; experimental use among teens increased from 1.1% to 2.1% in 2011-2012.[5,6] Even without clear evidence of efficacy, use of e-cigarettes for cessation or harm reduction purposes in England has exceeded nicotine replacement therapy (NRT).[7] The free market suggests there is pent-up interest in products that deliver cleaner nicotine in a safe, appealing mode. Whether this can be translated into a sustained disruptive technology depends on factors including innovation of better products, enhanced labeling and marketing, and appropriate regulation and policy implementation.

### US Food and Drug Administration Regulation

Product regulation is essential to minimize unintended consequences and to appropriately reassure consumers. However, regulations should not be so burdensome as to stifle innovation and independent manufacturers.[1,8-10] A comprehensive nicotine regulatory policy is needed from the US Food and Drug Administration (FDA). Embracing harm reduction, the director of the FDA's Center for Tobacco Products (CTP) proposed a continuum of risk, with combustible products (eg, cigarettes, cigars, and hookahs) posing the most hazard and NRTs posing the least.[9,10] Tobacco control should be based on proportional risk that strongly discourages combusting tobacco and encourages smokers who cannot quit to use safer forms of nicotine including more flexible uses of over-the-counter NRTs.

Assuming appropriate scientific studies are completed (to validate degree of harm reduction, cessation efficacy, craving reduction, and relapse prevention), e-cigarettes could be approved under the Center for Drug Evaluation and Research (CDER) and by CTP to maximize the promise and minimize potential risk of these products, but preferably with premarket requirements that are not overly burdensome for provisional approval by either the CTP or by the CDER. Simultaneously CTP regulation can also be used to make conventional cigarettes less appealing and satisfying using product standards to reduce the nicotine levels in these cigarettes to nonaddictive, nonzero levels, as permitted by law.

A balance between underregulation and overregulation is achieved by flexible and discretionary use of product standard, modified risk, and cessation regulations. Aggressive postmarketing surveillance should be used to detect unintended consequences.[1-3,8-10] Applying overly burdensome, expensive regulatory hurdles to e-cigarettes could stifle innovation and favor the market domination of tobacco companies, which potentially promote dual use of cigarettes and e-cigarettes to minimize losing market share for their primary cigarette products. Independent e-cigarette companies (ie, not subsidiaries of tobacco companies) are more likely to have the goal of eliminating combusted cigarettes.[8]

### Federal and State Tobacco Control Policy and Practice

Other approaches to achieve maximal benefit of e-cigarettes would follow the proportional risk frame-

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work. e-Cigarettes and some noncombustible nicotine delivery products can be used as part of a harm reduction strategy, as a reduce-to-eventually-quit strategy, as a cessation strategy, or to prevent relapse back to smoking.

### Federal and State Taxation

Taxes should be proportional to harms and should include, for example, health care subsidies and full insurance coverage for long-term NRT (even for a lifetime); no or minimal tax on e-cigarettes or Swedish-type snus, and a doubling or tripling of the current tax on all combustible tobacco products.

### Indoor Air and Public Restrictions

At present there is little research basis for or against restrictions. Studies of secondhand vapor from e-cigarettes show minimal known harmful exposure compared with conventional cigarettes and reasonable indoor air standards.[8] The potential concern is that e-cigarettes undermine denormalization of smoking. Harm reduction advocates point out that people can readily see these products are not conventional cigarettes and that e-cigarettes are a mechanism to quit smoking rather than prolonging it. Thus, e-cigarettes are a gateway out of smoking and may further denormalize smoking and normalize safer alternatives.[8] The risk of unintended consequences must be monitored. The concern is if most smokers use e-cigarettes as a "bridge" to alleviate craving only when they cannot smoke or to delay cessation, then net population harms might possibly exceed benefits even if some individual users benefit.

### Practitioners in Health Care and Public Health

Clinicians counseling patients about smoking cessation should first recommend FDA-approved, evidence-based treatments for cessation. However, for smokers who cannot quit, clinicians could point out the reduced harms associated with noncombusted nicotine products. Assuming FDA regulation, exclusive use of noncombusted, nicotine-containing products like e-cigarettes and Swedish snus with low nitrosamines[10] is preferable to any combusted tobacco use (eg, cigarettes, cigars, pipes, and hookahs).

### The Appeal to Youth

Tobacco products of any kind should not be sold to persons younger than 18 years. Young people should not be targets of marketing for any tobacco products. Products should not be made attractive to youth. Advertising should not resemble in any way the old approach of tobacco companies (eg, the use of cartoon characters like Joe Camel). Aggressive surveillance and enforcement at every level of tobacco control and at point-of-sale by the FDA is clearly warranted. According to the public health standard, restriction of sales and advertising to minors minimizes the potential harms of potential use by minors, offsetting the net benefits of having minimal restrictions on adults so that e-cigarettes remain attractive, accessible, and appealing to cigarette users to accelerate making conventional cigarettes obsolete.

## Conclusions

The more appealing e-cigarette innovations become, the more likely they will be a disruptive technology. Although the science is insufficient to reach firm conclusions on some issues, e-cigarettes, with prudent tobacco control regulations, do have the potential to make the combusting of tobacco obsolete. Strong regulatory science research is needed to inform policy. If e-cigarettes represent the new frontier, tobacco control experts must be open to new strategies. Statements based on ideology and insufficient evidence could prevent the use of this opportunity before it becomes established as part of harm reduction strategy. Overly restrictive policies by either the FDA, the states, and tobacco control advocates might support the established tobacco industry, whose rapid entry into the marketplace and history of making potentially misleading claims of harm reduction could promote poly-use of all their tobacco products, and thus perpetuate sales of conventional cigarettes well into the next century rather than speed their obsolescence.

Independent manufacturers of e-cigarettes could compete with tobacco companies and make the cigarette obsolete, just as digital cameras made film obsolete. Use of noncombusted nicotine products is preferable to perpetuating the use of combustible cigarettes and a second cigarette century. The stakes are high, with an estimated 430 000 premature deaths associated with tobacco use per year in the United States and more than 1 billion expected deaths associated primarily with combusted tobacco use worldwide by the next century.[11] The central question is whether e-cigarettes should be aggressively supported by tobacco control in what already appears to be its free market significant rise as a disruptive technology—an extraordinary opportunity to end the cigarette century well before the 100th anniversary of the surgeon general's report on smoking and health in 2064.

ARTICLE INFORMATION

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# My Turn: E-cig restrictions unreasonable, premature

Posted: March 18, 2014 - 12:01am

By ROBERT RODMAN

FOR THE JUNEAU EMPIRE

Now over a month into the legislative session, some lawmakers in Juneau are considering enacting a statewide ban on the use of e-cigarettes in public places, including indoors. If lawmakers proceed with Senate Bill 209 and House Bill 360, they will erroneously expand an existing smoking ban to products that do not emit smoke. In doing so, they may unnecessarily impose burdensome restrictions on adult consumers and get in the way of these products playing a role in reducing tobacco-related harm in a Food and Drug Administration (FDA) regulated environment.

Lawmakers should take some time to consider the important, distinctions between e-cigarettes and cigarettes. While they may share a similar name and shape, e-cigarettes have unique characteristics and construction that should not be ignored. E-cigarettes contain a battery-powered heating device that vaporizes a nicotine or nicotine-free fluid. The vapor they produce is then inhaled. An e-cigarette does not require a flame, nor does it combust like regular cigarettes. As a result, it does not produce smoke. I feel I must reiterate that point: e-cigarettes do not produce smoke, they produce vapor. Even the act of using an e-cigarette is called "vaping," not "smoking."

Scientists and federal regulators are examining the applications of e-cigarettes in a national tobacco harm reduction strategy. The FDA is on the case. They have significant expertise and they have signaled their plans to carefully study the science on e-cigarettes to issue appropriate regulations that will be grounded in scientific research. Until federal officials present their scientific findings, Alaska lawmakers should refrain from imposing broad restrictions on e-cigarette use.

We need to learn more about how adult consumers intend to use e-cigarettes, otherwise legislators may act imprudently. Premature state action on e-cigarettes could cause of a myriad of unintended consequences. Not only would unwise e-cigarette restrictions unnecessarily burden adult consumers, they could stifle the migration to these vapor-emitting devices by deterring adult tobacco consumers from using new and potentially less risky tobacco products. By inhibiting adult consumer adoption of e-cigarettes, state lawmakers may interfere with the worthwhile efforts to create a national tobacco harm reduction policy. What's more, lawmakers should consider the maze of contradictory rules they may create if they impose use restrictions that differ from potential federal rules on the issue. Ultimately, Alaskan consumers and small businesses will have to navigate those possibly conflicting rules.

Furthermore, I believe this is an issue that can be best addressed outside the corridors of the Legislature. Business owners — such as retailers, restaurateurs or hotel operators — are best aware of how to accommodate the needs of their patrons. These hardworking Alaskans should have the opportunity and flexibility to determine the e-cigarette use policies that are best for them instead of mandates from Juneau.

Like many, I believe e-cigarettes should only be sold to and used by adults. I also support restrictions on the use of e-cigarettes in schools and other places meant for children. However, Senate Bill 209 and House Bill 360 go far beyond that. Lawmakers should follow science and evidence, and clearly that is still being developed. As lawmakers continue their work on these two bills in the coming weeks, I hope they will take these points into consideration and reject the unreasonable use restrictions on e-cigarette products that do not even emit smoke.

• Robert Rodman is a Juneau resident and owner of Percy's Liquor.



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# How e-cigarettes could save lives

© Bobby Yip / Reuters/REUTERS - Anti-smoking advocates should welcome electronic cigarettes, writes Sally Satel.

By Sally Satel, E-mail the writer

*Sally Satel is a resident scholar at the American Enterprise Institute and a psychiatrist specializing in addiction. She has served as an expert witness in tobacco litigation.*

Should electronic cigarettes be regulated like tobacco products, emblazoned with warnings and subject to tight marketing restrictions? Those are among the questions before the Food and Drug Administration as it decides in the coming weeks how to handle the battery-powered cigarette mimics that have become a $1.5 billion business in the United States.

Groups promoting intensive regulation include the American Lung Association and the Campaign for Tobacco-Free Kids. They worry that the health risks haven't been fully established and that e-cigarettes will make smoking commonplace again, especially among teens. They are quick to push back in response to anything that might make e-cigarettes more attractive, such as the NJOY King ad that aired during the Super Bowl or when actors

Leonardo DiCaprio and Julia Louis-Dreyfus were shown "vaping" at the Golden Globes.


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A surgeon general's report released last month, on the 50th anniversary of the office's first warning about the dangers of smoking, had little to say about e-cigarettes. Its suggestions for further reducing tobacco use were familiar, including: increase taxes on cigarettes, prohibit indoor smoking, launch media campaigns and reduce the nicotine content of cigarettes.

E-cigarettes, however, could be what we need to knock the U.S. smoking rate from a stubborn 18 percent to the government's goal of 12 percent by 2020. We should not only tolerate them but encourage their use.

Although critics stress the need for more research, we can say with high confidence that e-cigarettes are far safer than smoking. No tobacco leaves are combusted, so they don't release the tars and gases that lead to cancer and other smoking-related diseases. Instead, a heating element converts a liquid solution into an aerosol that users exhale as a white plume.

The solution comes in varying concentrations of nicotine — from high (36 mg per milliliter of liquid) to zero — to help people wean themselves off cigarettes, as well as e-cigarettes, and the addictive stimulant in them. But even if people continue using electronic cigarettes with some nicotine, regular exposure has generally benign effects in healthy people, and the FDA has approved the extended use of nicotine gums, patches and lozenges.

The other main ingredients in e-cigarettes are propylene glycol and glycerin. These are generally regarded as harmless — they're found in toothpaste, hand sanitizer, asthma inhalers, and many other FDA-approved foods, cosmetics and pharmaceuticals. There are also traces of nitrosamines, known carcinogens, but they are present at levels comparable to the patch and at far lower concentrations than in regular cigarettes — 500- to 1,400-fold lower. Cadmium, lead and nickel may be there, too, but in amounts and forms considered nontoxic.

"Few, if any, chemicals at levels detected in


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electronic cigarettes raise serious health concerns," a 2011 study in the Journal of Health Policy determined. "A preponderance of the available evidence shows [e-cigarettes] to be much safer than tobacco cigarettes and comparable in toxicity to conventional nicotine replacement products."

The potential for e-cigarettes to help people quit smoking is encouraging. Yet so far there has been little research on their effectiveness. A study published in the Lancet in November concluded that e-cigarettes, with or without nicotine, were as effective as nicotine patches for helping smokers quit. Granted, patches have had a disappointing record in helping people stay off cigarettes for more than a few months. But there are reasons to think that e-cigarettes would be even more effective outside the laboratory.

Participants in the Lancet study were randomly assigned to nicotine e-cigarettes, patches or placebo e-cigarettes. In the real world, of course, people get to choose. And e-cigarettes have several advantages over patches and gums. For one, they provide a quicker fix, because the pulmonary route is the fastest practical way to deliver nicotine to the brain. They also offer visual, tactile and gestural similiarities to traditional cigarettes.

Reporter Megan McArdle tested the comparison for a Bloomberg Businessweek article this month: "After I'd put it together, I had something surprisingly close to one of the cigarettes I used to smoke. The mentholated tobacco flavor rolled sinuously over my tongue, hit the back of my throat in an unctuously familiar cloud, and rushed through my capillaries, buzzing along my dormant nicotine receptors. The only thing missing was the unpleasant clawing feeling in my chest as my lungs begged me not to pollute them with tar and soot."

This is where anti-smoking advocates get worried about e-cigarettes being too attractive and encouraging people — especially young people — to become addicted to nicotine and, in some cases, to progress to smoking. The Centers for Disease Control and Prevention stoked concerns with data released in September showing that 1.78 million middle and high school students had tried e-cigarettes and that one in five middle school students who reported trying them said they hadn't tried traditional cigarettes. "This raises concern that there may be young people for whom e-cigarettes could be an entry point to use of conventional tobacco products, including cigarettes," the CDC concluded.

According to that same CDC study, however, an extremely small percentage of teenagers use e-cigarettes regularly — only 2.8 percent of high school students reported using one in the previous 30 days in 2012. And while that number is rising — it was 1.5 percent in 2011 — teenage cigarette smoking rates are at record lows. That might suggest that increased exposure to e-cigarettes isn't encouraging more people to smoke. But the numbers are so small that it's too early to make definitive claims about the relationship between teen vaping and smoking.

Yes, we still need research on the long-term health and behavioral impacts of e-cigarettes. Brad Rodu, a pathologist at the University of Louisville, offers an apt analogy between electronic cigarettes and cellphones. When cellphones became popular in the late '90s, there were no data on their long-term safety. As it turns out, the risk of a brain tumor with prolonged cellphone use is not zero, but it is very small and of uncertain health significance.

In the case of e-cigarettes, Rodu says that "at least a decade of continued use by thousands of users would need to transpire before confident assessments could be conducted." Were

the FDA to ban e-cigarette marketing until then, the promise of vaping would be put on hold. Meanwhile, millions of smokers who might otherwise switch would keep buying tobacco products. "We can't say that decades of e-cigarette use will be perfectly safe," Rodu told me, "but for cigarette users, we are sure that smoke is thousands of times worse."

The FDA should call for reliable, informative labeling and safe manufacturing standards for e-cigarettes. It should also allay concerns about potential gateway use and youth addiction to nicotine by banning the marketing and sale of e-cigarettes to minors. It should not be heavyhanded in restricting marketing and sales to adults.

Instead, promoting electronic cigarettes to smokers should be a public health priority. Given that the direct medical costs of smoking are estimated to be more than $130 billion per year, along with $150 billion annually in productivity losses from premature deaths, getting more smokers to switch would result in significant cost savings — as well as almost half a million lives saved each year.



We should make e-cigarettes accessible to smokers by eschewing hefty taxes, if we tax them at all, and offering free samples and starter kits. Those kits, which contain a battery, a charger and nicotine-liquid cartridges, typically run between $30 and $90. To reduce the hurdle to initiation, any payer of smoking-related costs — health insurers, Veterans Affairs medical centers, companies that offer smoking-cessation programs for their employees, Medicare, Medicaid — should make the starter kits available gratis. Users should have to pay for their own replacement cartridges, but those are much cheaper than cigarette packs.

Also, we should allow and welcome public vaping in adult environments such as bars, restaurants and workplaces. Vapers would serve as visual prompts for smokers to ask about vaping and, ideally, ditch traditional cigarettes and take up electronic ones instead.



It may be hard for anti-smoking activists to feel at ease with e-cigarettes in light of their view that traditional cigarette makers have long downplayed the health dangers of their product. This perception has generated distrust of anything remotely resembling the act of smoking. It doesn't help that major tobacco companies are now investing in e-cigarettes.

But if we embrace electronic cigarettes as a way for smokers to either kick their nicotine addictions or, at least, obtain nicotine in a safer way, they could help instigate the wave of smoking cessation that anti-smoking activists — and all of us — are hoping for.

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