

The Health Consequences of Involuntary Exposure to Tobacco Smoke

A Report of the Surgeon General



Department of Health and Human Services

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2006年報告書



Centers for Disease Control and Prevention
Coordinating Center for Health Promotion
National Center for Chronic Disease Prevention and Health Promotion
Office on Smoking and Health

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A Report of Surgeon General

(米国公衆衛生総監報告＝日本の厚生労働大臣)

“The health consequences on involuntary exposure to tobacco smoke”(2006)

「受動喫煙に起因する健康影響に関する結論」

“The debate is over. The science is clear”

「(有害性に関する)議論は終わった。科学的証拠は明白」

- ・受動喫煙は深刻な健康被害をもたらす
- ・受動喫煙は危険である
- ・受動喫煙に安全なレベル(閾値)は存在しない
- ・数百万人の非喫煙者(米国人)が受動喫煙に曝露されている
- ・すべての人が受動喫煙に曝露されない権利を有する
- ・無煙の環境を作ることが必要
- ・小児科医は子ども達を自宅での受動喫煙から守るために、家庭環境の無煙化を進めねばならない(気管支喘息、つ突然死症候群の観点)

The Health Consequences
of Involuntary Exposure
to Tobacco Smoke

A Report of the Surgeon General



Department of Health and Human Services

Foreword

序文 (2006年報告)

This twenty-ninth report of the Surgeon General documents the serious and deadly health effects of involuntary exposure to tobacco smoke. Secondhand smoke is a major cause of disease, including lung cancer and coronary heart disease, in healthy nonsmokers.

In 2005, it was estimated that exposure to secondhand smoke kills more than 3,000 adult nonsmokers from lung cancer, approximately 46,000 from coronary heart disease, and an estimated 430 newborns from sudden infant death syndrome. In addition, secondhand smoke causes other respiratory problems in nonsmokers such as coughing, phlegm, and reduced lung function. According to the CDC's National Health Interview Survey in 2000, more than 80 percent of the respondents aged 18 years or older believe that secondhand smoke is harmful and nonsmokers should be protected in their workplaces.

2005年、受動喫煙に曝露された非喫煙者が、肺がんで3,000人、心血管疾患で46,000人死亡していること、新生児430人が乳幼児突然死症候群で死亡している、と評価された。それ以外に、受動喫煙は非喫煙者の咳、痰、肺機能障害の原因となる。受動喫煙は健康に有害であり、非喫煙者は保護されねばならない。

1. SUMMARY AND CONCLUSIONS

1.1. MAJOR CONCLUSIONS

Based on the weight of the available scientific evidence, the U.S. Environmental Protection Agency (EPA) has concluded that the widespread exposure to environmental tobacco smoke (ETS) in the United States presents a serious and substantial public health impact.

In adults:

- ETS is a human lung carcinogen, responsible for approximately 3,000 lung cancer deaths annually in U.S. nonsmokers.

In children:

- ETS exposure is causally associated with an increased risk of lower respiratory tract infections (LRIs) such as bronchitis and pneumonia. This report estimates that 150,000 to 300,000 cases annually in infants and young children up to 18 months of age are attributable to ETS.

1. サマリーと結論 (2006年)

1.1 主たる結論

アメリカ環境保護庁(EPA)は受動喫煙により、アメリカ国民に深刻で重大な健康影響が発生していることを結論する。

成人：受動喫煙は肺に対する発がん性があり、米国で毎年3,000人の非喫煙者が受動喫煙により死亡。

小児：末梢気道疾患(気管支炎、肺炎)のリスクである。受動喫煙により、毎年15~30万人の乳幼児(18ヵ月以下)の末梢気道疾患の原因となっている。

Surgeon General's Report (2006年報告, p11)

Major Conclusions、6つの結論解説

With regard to the involuntary exposure of nonsmokers to tobacco smoke, the scientific evidence now supports the following major conclusions:

1. Secondhand smoke causes premature death and disease in children and in adults who do not smoke.

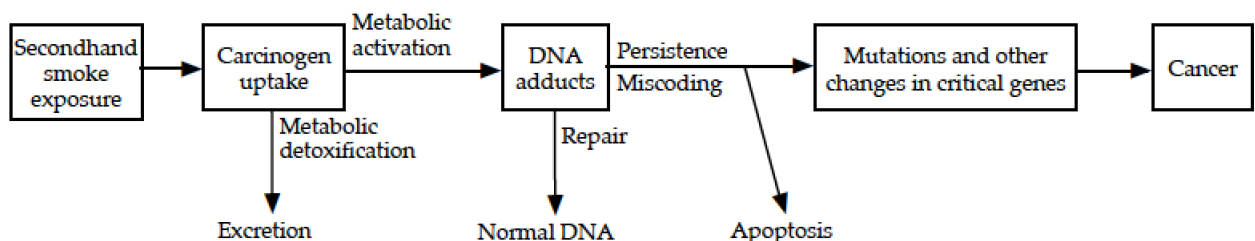
1. 受動喫煙はタバコを吸わない成人、小児の早世と疾病の原因となる

A Report of the Surgeon General (2006年報告, 43頁)

The Health Consequences of Involuntary Exposure to Tobacco Smoke

発がん性のメカニズムに関する結論

Figure 2.2 Scheme showing the steps linking secondhand smoke exposure and cancer via tobacco smoke carcinogens



受動喫煙→発がん性物質摂取→DNA付加体による損傷→突然変異→発がん

Table 7.4 Quantitative estimate of lung cancer risk with differing sources of exposure to secondhand smoke

Study	Data source	Exposure vs. referent	Relative risk	95% confidence interval
過去の論文 (配偶者から曝露) Previous meta-analyses				
Hackshaw et al. 1997	37 studies	Smoking vs. nonsmoking spouse	1.24	1.13-1.36
Zhong et al. 2000	40 studies (including 37 from Hackshaw et al. 1997)	Smoking vs. nonsmoking husband	1.20	1.12-1.29
2006年報告 (配偶者から曝露) Spousal smoking (52 studies)				
Meta-analysis conducted for this 2006 Surgeon General's report	Case-control (44 studies)	Smoking vs. nonsmoking spouse	1.21	1.13-1.30
	Cohort (8 studies)	Smoking vs. nonsmoking spouse	1.29	1.125-1.49
	Men	Smoking vs. nonsmoking wife	1.37	1.05-1.79
米国公衆衛生総監 2006年報告書のためのメタアナリシス	Women	Smoking vs. nonsmoking husband	1.22	1.13-1.31
	United States and Canada	Smoking vs. nonsmoking spouse	1.15	1.04-1.26
	Europe	Smoking vs. nonsmoking spouse	1.16	1.03-1.30
	Asia	Smoking vs. nonsmoking spouse	1.43	1.24-1.66

Table 7.4の続き

職場の受動喫煙 (25研究) Workplace exposure (25 studies)

肺がん1.13~1.32倍

米国公衆衛生総監 2006年報告書のためのメタアナリシス	Meta-analysis conducted for this 2006 Surgeon General's report	Nonsmokers (25 studies)	Workplace secondhand smoke vs. none	1.22	1.13-1.33
		Nonsmoking men (11 studies)	Workplace secondhand smoke vs. none	1.12	0.86-1.50
		Nonsmoking women (25 studies)	Workplace secondhand smoke vs. none	1.22	1.10-1.35
		Nonsmokers in the United States and Canada (8 studies)	Workplace secondhand smoke vs. none	1.24	1.03-1.49
		Nonsmokers in Europe (7 studies)	Workplace secondhand smoke vs. none	1.13	0.96-1.34
		Nonsmokers in Asia (10 studies)	Workplace secondhand smoke vs. none	1.32	1.13-1.55

小児期の受動喫煙 (24研究) Childhood exposure (24 studies)

肺がん0.81~1.59倍

2006年報告書のためのメタアナリシス (2006年報告, 436頁)	Meta-analysis conducted for this 2006 Surgeon General's report	Men and women	Maternal smoking	1.15	0.86-1.52
		Men and women	Paternal smoking	1.10	0.89-1.36
		Men and women	Smoking by either parent	1.11	0.94-1.31
		Women	Maternal smoking	1.28	0.93-1.78
		Women	Paternal smoking	1.17	0.91-1.50
		United States and Canada (8 studies)	Smoking by either parent	0.93	0.81-1.07
		Europe (6 studies)	Smoking by either parent	0.81	0.71-0.92
		Asia (10 studies)	Smoking by either parent	1.59	1.18-2.15

Conclusions

結論：肺がん

1. 受動喫煙が非喫煙者の肺がんのリスクになることについて、**十分な証拠**が得られた。
職場、家庭、地域と関係なく結論づけられた。
2. 喫煙者とともに生活することにより、（非喫煙者の）肺がんリスクは**20~30%上昇**する。

Lung Cancer

1. The evidence is sufficient to infer a causal relationship between secondhand smoke exposure and lung cancer among lifetime nonsmokers. This conclusion extends to all secondhand smoke exposure, regardless of location.
2. The pooled evidence indicates a 20 to 30 percent increase in the risk of lung cancer from secondhand smoke exposure associated with living with a smoker.

受動喫煙による肺がん：
日本人のエビデンス（大規模コホート）、
家庭内曝露

Int. J. Cancer: 122, 653–657 (2008)
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Passive smoking and lung cancer in Japanese non-smoking women:
A prospective study

Norie Kurahashi^{1*}, Manami Inoue¹, Ying Liu¹, Motoki Iwasaki¹, Shizuka Sasazuki¹, Tomotaka Sobue²
and Shoichiro Tsugane¹ for the JPHC Study Group

TABLE II – ASSOCIATION BETWEEN LUNG CANCER INCIDENCE AND PASSIVE SMOKING FROM THE HUSBAND IN LIFELONG NON-SMOKING WOMEN (n = 28,414)

Type of exposure	All lung cancer			Adenocarcinoma		
	Case (N)	Person-years	Multivariate HR (95% CI)	Case (N)	Person-years	Multivariate HR (95% CI)
From husband						
Never	25	97,466	1	15	97,392	1
Former	28	94,427	1.12 (0.63–1.98)	21	94,358	1.50 (0.73–3.09)
Current	56	185,919	1.34 (0.81–2.21)	46	185,855	2.03 (1.07–3.86)
Number of cigarettes per day						
<20	14	52,441	1.02 (0.51–2.04)	13	52,438	1.73 (0.77–3.88)
≥20	41	131,107	1.47 (0.87–2.49)	33	131,055	2.20 (1.13–4.28)
p for trend			0.14			0.02
Pack years of exposure						
<30	17	76,125	1.05 (0.55–2.02)	16	76,122	1.86 (0.86–4.01)
≥30	36	104,330	1.46 (0.85–2.50)	28	104,279	2.06 (1.04–4.10)
p for trend			0.17			0.03

Adjusted for age, study area, alcohol consumption, family history of lung cancer and menopausal status.

全肺がん：夫が非喫煙の妻の発症を1.0、夫が元喫煙は1.12倍、現喫煙は1.34倍
夫の喫煙本数が20本以下で1.02倍、20本以上は1.47倍
夫からの曝露が30箱・年以下で1.05倍、30箱・年以上は1.46倍

受動喫煙による肺がん：
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肺腺がん：夫が非喫煙の妻の発症を1.0、夫が元喫煙は1.50倍、現喫煙は2.03倍
夫の喫煙が20本以下は1.73倍、20本以上は2.20倍で、量反応関係あり (p=0.02)
夫からの曝露が30箱・年以下は1.86倍、30箱・年は2.06倍、量反応関係あり (p=0.03)

受動喫煙による肺がん：
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TABLE III – ASSOCIATION BETWEEN LUNG CANCER INCIDENCE AND PASSIVE SMOKING AT THE WORKPLACE AND FROM TWO SOURCES IN LIFELONG NON-SMOKING WOMEN (n = 28,414)

Type of exposure	All lung cancer			Adenocarcinoma		
	Case (N)	Person-years	Multivariate HR (95%CI)	Case (N)	Person-years	Multivariate HR (95% CI)
At workplace						
<1 time/week	77	279,421	1	60	279,299	1
≥1 times/week	30	94,652	1.32 (0.85–2.04)	20	94,568	1.16 (0.69–1.97)
From two sources						
Source of exposure						
Almost never ¹	17	80,428	1	12	80,395	1
Workplace only ²	8	16,236	2.74 (1.11–6.76)	3	16,195	1.21 (0.26–5.55)
Husband only ³	60	198,994	1.49 (0.84–2.62)	48	198,904	1.79 (0.90–3.55)
Workplace + Husband	22	78,417	1.61 (0.83–3.11)	17	78,373	1.93 (0.88–4.23)

¹Women exposed at the workplace less than one time per week.–²Women exposed at the workplace one or more times per week.–³Women exposed from husbands who are former or current smokers.

Adjusted for age, study area, alcohol consumption, family history of lung cancer and menopausal status.

全肺がん：職場での曝露が週1時間以下を1.0、週1時間以上の曝露で1.32倍
職場でも家庭でも曝露なしを1.0、職場のみで曝露は2.74倍
家庭（夫）からのみ曝露で1.49倍、職場と家庭の両方の曝露で1.61倍

受動喫煙による肺がん：
日本人のエビデンス（大規模コホート）
家庭&職場での曝露

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¹Women exposed at the workplace less than one time per week. ²Women exposed at the workplace one or more times per week. ³Women exposed from husbands who are former or current smokers.

Adjusted for age, study area, alcohol consumption, family history of lung cancer and menopausal status.

肺腺がん：職場での曝露が週1時間以下を1.0、週1時間以上の曝露で1.16倍
職場でも家庭でも曝露なしを1.0、職場のみで曝露は1.21倍、
家庭（夫）からのみ曝露で1.79倍、職場と家庭の両方の曝露で1.93倍

受動喫煙で乳がんのリスクも上昇、1.15倍 (米国公衆衛生総監2006年報告, 471頁)

Table 7.10 Pooled risk estimates and 95% confidence intervals (CI) for breast cancer meta-analysis

Exposure	All women		Premenopausal		Postmenopausal	
	n*	Relative risk (95% CI)	n	Relative risk (95% CI)	n	Relative risk (95% CI)
Adulthood						
All sources	18	1.15 (1.02–1.29) [0.000] [†]	10	1.45 (1.04–2.01) [0.000]	9	0.90 (0.81–1.01) [0.691]
Spouse	9	1.17 (0.96–1.44) [0.002]	4	1.40 (0.92–2.12) [0.1]	3	0.86 (0.67–1.12) [0.645]
Home	8	1.01 (0.85–1.19) [0.006]	4	1.28 (0.94–1.74) [0.355]	3	0.92 (0.76–1.11) [0.591]
Work	6	1.06 (0.84–1.35) [0.008]	4	1.21 (0.70–2.09) [0.000]	3	0.83 (0.53–1.29) [0.086]
Childhood (parent)	9	1.01 (0.90–1.12) [0.101]	4	1.14 (0.90–1.45) [0.342]	3	1.04 (0.86–1.26) [0.242]
Both childhood and adulthood	4	1.39 (0.88–2.18) [0.021]	3	1.63 (0.68–3.91) [0.016]	2	1.02 (0.74–1.42) [0.160]
Ever exposed (in studies measuring lifetime exposure)	10	1.40 (1.12–1.76) [0.000]	6	1.85 (1.19–2.87) [0.001]	5	1.04 (0.84–1.30) [0.048]
“Best” of each study [‡]	21	1.20 (1.08–1.35) [0.000]	11	1.64 (1.25–2.14) [0.001]	10	1.00 (0.88–1.12) [0.321]
Cohort studies	7	1.02 (0.92–1.13) [0.162]				
Case-control studies	14	1.40 (1.17–1.67) [0.000]				

*n = Number of studies included in each analysis.

[†][in brackets] = p value for test of heterogeneity (null hypothesis is no heterogeneity).

[‡]“Best” of each study includes the most comprehensive measure of association from each study: ever being exposed in any setting was preferred over all sources during adulthood, which was preferred over spousal exposure.

配偶者からの受動喫煙で乳がんのリスクが1.15倍

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(米国公衆衛生総監2006年報告, 471頁)

*n = Number of studies included in each analysis.

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[‡]“Best” of each study includes the most comprehensive measure of association from each study: ever being exposed in any setting was preferred over all sources during adulthood, which was preferred over spousal exposure.

Conclusions

受動喫煙による発がんについての結論

1. 50種類以上の発がん性物質が（2004年IARCは64種類、現在は70種類）
2. 受動喫煙による発がん性は動物実験で明白
3. 受動喫煙により尿中のタバコ由来発がん性物質の代謝産物が有意に上昇、これらの代謝物質は肺がんの発生を高めることと関連
4. 受動喫煙による発がんのメカニズムは、そのレベルは低いものの、能動喫煙と類似

Evidence of Carcinogenic Effects from Secondhand Smoke Exposure

1. More than 50 carcinogens have been identified in sidestream and secondhand smoke.
2. The evidence is sufficient to infer a causal relationship between exposure to secondhand smoke and its condensates and tumors in laboratory animals.
3. The evidence is sufficient to infer that exposure of nonsmokers to secondhand smoke causes a significant increase in urinary levels of metabolites of the tobacco-specific lung carcinogen 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK). The presence of these metabolites links exposure to secondhand smoke with an increased risk for lung cancer.

4. The mechanisms by which secondhand smoke causes lung cancer are probably similar to those observed in smokers. The overall risk of secondhand smoke exposure, compared with active smoking, is diminished by a substantially lower carcinogenic dose.

Conclusion

Sudden Infant Death Syndrome

2006年報告書, p180-194

1. The evidence is sufficient to infer a causal relationship between exposure to secondhand smoke and sudden infant death syndrome.

乳児突然死症候群に関する結論 1 :
 受動喫煙と乳児突然死症候群 (SIDS) には十分な因果関係あり

Case-control study13報告のうち9番目の報告

Blair et al. 1996	Case-control (195 cases, 780 controls, 4 per case matched for age) United Kingdom (Southwest, Yorkshire, and Trent) 1993-1995	<ul style="list-style-type: none"> • Smoking status of mother, father, and others in household • Number of smokers in household • Number of cigarettes smoked daily in household 	Postpartum exposure from <ul style="list-style-type: none"> • Mother • Father • Other household members
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Surgeon General's SIDS

Sudden In

2006年報告書, 主要な結論 1 乳児突然死症候群の原因 p180-194

Case-control study13報告のうち9番目の報告
 両親（特に、母）、自宅内喫煙者の数、自宅内喫煙本数、曝露時間が長い程、SIDSのリスク上昇

Parental smoking status

Only father smoked: OR = 3.41 (95% CI, 1.98-5.88)
 Only mother smoked: OR = 7.01 (95% CI, 3.91-12.56)
 Both parents smoked: OR = 8.41 (95% CI, 5.08-13.92)
 Adjusted for maternal smoking during pregnancy

Multivariate analysis

Postnatal paternal smoking, additive to maternal smoking OR = 2.50 (95% CI, 1.48-4.22)
 Adjusted for mother's age, mothers without partners, parity, multiple births, short gestation, socioeconomic status, sleeping position, maternal alcohol consumption, parental use of illegal drugs, parental bed sharing, breastfeeding, and birth weight

Postnatal paternal smoking, additional adjustment for maternal smoking during pregnancy
 Nonsignificant (p = 0.1601)

Number of smokers at home

1 smoker: OR = 2.44 (95% CI, 1.36-4.37)
 2 smokers: OR = 5.15 (95% CI, 3.24-8.21)
 >2 smokers: OR = 10.43 (95% CI, 3.34-32.54)

Cigarettes/day smoked at home

1-19 cigarettes/day: OR = 2.47 (95% CI, 1.29-4.73)
 20-39 cigarettes/day: OR = 3.96 (95% CI, 2.40-6.55)
 >39 cigarettes/day: OR = 7.57 (95% CI, 4.00-14.32)

Infant's daily exposure to tobacco smoke (hours)

1-2: OR = 1.99 (95% CI, 1.14-3.46)
 3-5: OR = 3.84 (95% CI, 1.97-7.48)
 6-8: OR = 6.78 (95% CI, 3.17-14.49)
 >8: OR = 8.29 (95% CI, 4.28-16.05)

Exposure data were self-reported (questionnaire); multivariate analysis found nonsignificant effect for other smoking members of household; unclear if postnatal dose-response analyses adjusted for maternal prenatal smoking or other confounding factors; dose-response analyses were limited to households where smoking was allowed in the same room as the infant; exposure to secondhand smoke in the home has an independent effect on the risk of SIDS

Blair et al. 1996

父のみ 3.41倍
 母のみ 7.01倍
 両親 8.41倍

自宅での喫煙者数

1名	2.44倍
2名	5.15倍
2名以上	10.43倍

自宅での喫煙本数

1~19本	2.47倍
20~39本	3.96倍
39本以上	10.43倍

受動喫煙曝露時間

1~2時間	1.99倍
3~5時間	3.84倍
6~8時間	6.78倍
8時間以上	8.29倍

<i>Surgeon General's Report</i> 2006, p180-194 Sudden Infant Death Syndrome Case-control study 13報告 のうち10番目の報告		Conclusion 1. The evidence is sufficient to infer a causal relationship between exposure to secondhand smoke and sudden infant death syndrome.							
Brooke et al. 1997	Case-control (147 cases, 276 controls, 2 controls per case from births immediately before and after index case, thus matched for age, season, and maternity unit) Scotland 1992-1995	<ul style="list-style-type: none"> Smoking status of mother and father Mother and father 	<div style="border: 1px solid black; padding: 5px;"> 乳児突然死症候群に関する結論1： SHSはSIDSとの十分な因果関係あり </div> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <table> <tr> <td>父のみ</td> <td>2.12倍</td> </tr> <tr> <td>母のみ</td> <td>5.05倍</td> </tr> <tr> <td>両親とも</td> <td>5.19倍</td> </tr> </table> </div>	父のみ	2.12倍	母のみ	5.05倍	両親とも	5.19倍
父のみ	2.12倍								
母のみ	5.05倍								
両親とも	5.19倍								
SIDS	Only father smoked OR = 2.12 (95% CI, 0.99-4.55) Only mother smoked OR = 5.05 (95% CI, 1.85-13.77) Both parents smoked OR = 5.19 (95% CI, 2.26-11.91)	Exposure data were self-reported (questionnaire); all cases were autopsied; adjusted for sleeping position, old mattress, maternal age, deprivation score, moved under sheets, maternal marital status, social class, use of cot bumper, sleeping with parents, symptoms in previous week, gestational age, was usually swaddled in previous week, history of infant death in family, sweaty upon waking, warmth, maternal education, breastfeeding, parity, and birth weight; parental smoking is confirmed as a modifiable risk factor for SIDS							

<i>Surgeon General's Report</i> 2006, p180-194 Sudden Infant Death Syndrome <div style="border: 1px solid black; padding: 2px;"> Meta-analysisの報告 </div>		Conclusion 1. The evidence is sufficient to infer a causal relationship between exposure to secondhand smoke and sudden infant death syndrome.	
Anderson and Cook 1997	Meta-analysis Systematic qualitative review of epidemiologic evidence (studies were identified by electronically searching EMBASE ^s and Medline) 39 relevant studies were assessed (43 papers)	<ul style="list-style-type: none"> Maternal prenatal and postnatal smoking Mother 母親の出産前、出産後の喫煙の有無	<div style="border: 1px solid black; padding: 5px;"> 乳児突然死症候群に関する結論1： SHSはSIDSとの十分な因果関係あり </div>
39研究(43論文)の分析			
SIDS	Prenatal maternal smoking OR = 2.08 (95% CI, 1.96-2.21) Postnatal maternal smoking OR = 1.94 (95% CI, 1.55-2.43)	Pooled adjusted ORs were calculated using a fixed effects model; calculated results are also available using a random effects model; results are also available for pooled unadjusted ORs; the relationship between maternal smoking and SIDS is almost certainly causal—maternal smoking doubled the risk	
<div style="border: 1px solid black; padding: 5px;"> 母親の出産前の喫煙 2.08倍 出産後の喫煙 1.94倍 </div>			

Mechanisms of Respiratory Tract Injury and Disease Caused by Secondhand Smoke Exposure

2006年報告書、46～52頁

呼吸器系疾患の障害と疾患のメカニズムは受動喫煙の曝露に起因する

- ・ 気管支喘息
- ・ 呼吸器感染症
- ・ 慢性閉塞性肺疾患 (COPD)
- ・ 乳児突然死症候群 (SIDS)

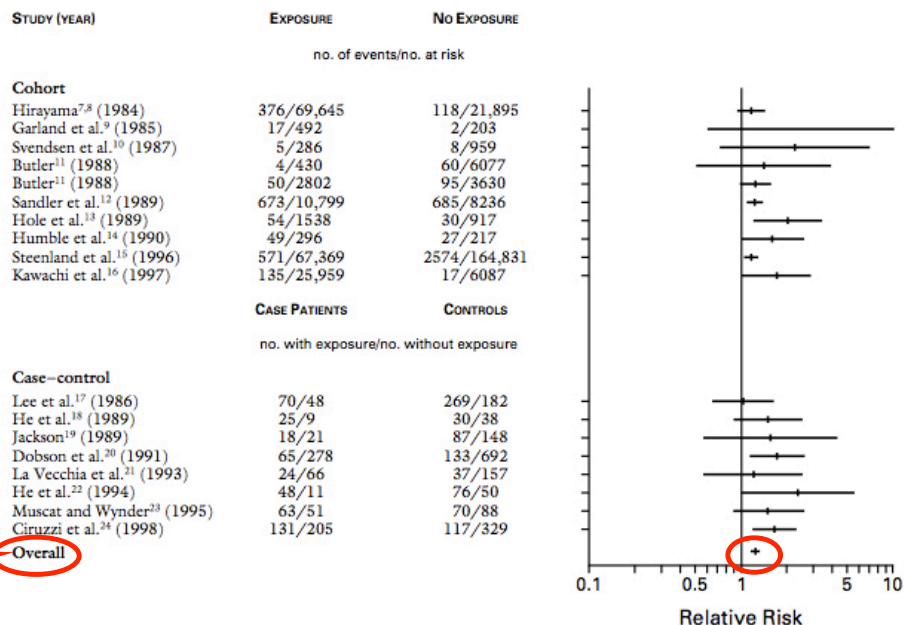
呼吸器系疾患の結論

1. 科学的証拠は受動喫煙が複数のメカニズムにより呼吸器を障害することを示した
2. 受動喫煙による乳児突然死症候群のリスクも上昇も明らか

Conclusions

1. The evidence indicates multiple mechanisms by which secondhand smoke exposure causes injury to the respiratory tract.
2. The evidence indicates mechanisms by which secondhand smoke exposure could increase the risk for sudden infant death syndrome.

職場と家庭の受動喫煙で心血管疾患が1.25倍に増加



All

Overall

Figure 1. Relative Risks of Coronary Heart Disease Associated with Passive Smoking among Nonsmokers in 18 Epidemiologic Studies. The horizontal bars represent the 95 percent confidence intervals. The relative risk in the study by Garland et al.⁹ was 14.9.

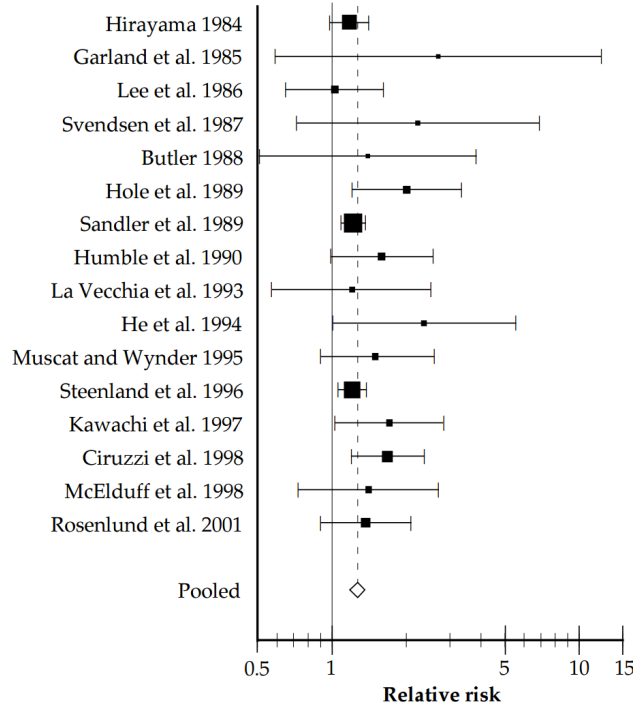
He J, et al.: Passive smoking and the risk of coronary heart disease- A meta-analysis of epidemiologic studies. N Engl J Med. 340: 920-926, 1999.

Surgeon General's Report 2006. (2006年報告, 524頁)

受動喫煙による冠動脈疾患リスク: 1.27 倍 (95%CI, 1.19-1.36)

Figure 8.1 Relative risks of coronary heart disease associated with secondhand smoke exposure among nonsmokers*

Note: The horizontal bars represent the 95% confidence intervals (CIs), and the size of the box for each study reflects each study's weight in the pooled estimate, with a larger box indicating a larger weight.
*Pooled estimate = 1.27 (95% CI, 1.19-1.36), the dashed line.



米国公衆衛生総監
報告書2006のための
メタアナリシス

Surgeon General's Report 2006. 米国公衆衛生総監2006報告書のためのメタアナリシス (2006年報告, 526頁)

受動喫煙による冠動脈疾患リスク: 量・反応関係あり

Table 8.4 Studies included in the dose-response meta-analysis and pooled results

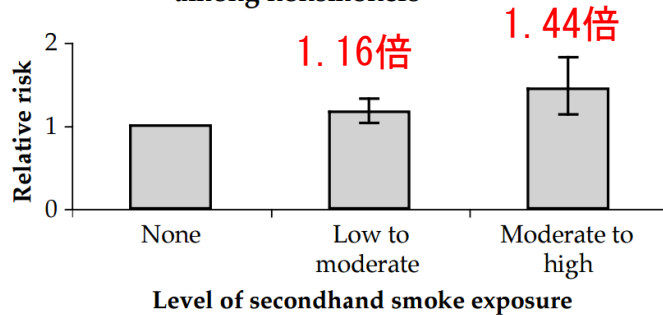
Study	Low to moderate exposure		Moderate to high exposure	
	Cigarettes/day	Relative risk (95% confidence interval)	Cigarettes/day	Relative risk (95% confidence interval)
Svensden et al. 1987	1-19	0.90 (0.02-6.70)	>19	3.21 (0.71-11.98)
Hole et al. 1989	1-15	2.09 (0.60-7.23)	>15	4.12 (1.21-14.05)
Hirayama et al. 1990	1-19	1.08 (0.9-1.3)	>19	1.3 (1.06-1.6)
La Vecchia et al. 1993	1-14	1.13 (0.45-2.82)	>14	1.3 (0.5-3.4)
He et al. 1994	6-20	1.61 (0.49-5.34)	>20	3.56 (0.81-15.58)
Steenland et al. 1996	1-19	1.31 (1.06-1.62)	>19	1.14 (0.97-1.34)
Ciruzzi et al. 1998	1-20	1.24 (0.61-2.52)	>20	4.03 (0.99-16.32)
Rosenlund et al. 2001	1-19	1.02 (0.73-1.42)	>19	1.58 (0.97-2.56)
Pooled results	Fixed effects:	1.16 (1.03-1.32)		1.26 (1.12-1.42)
	Random effects:	1.16 (1.03-1.32)		1.44 (1.13-1.82)

軽~中等度曝露

中~高度曝露

(前頁のグラフ化) 受動喫煙による冠動脈疾患リスク : 量・反応関係あり

Figure 8.3 Pooled relative risks of coronary heart disease associated with various levels of exposure to secondhand smoke among nonsmokers



Note: None, low to moderate (1-14 or 1-19 cigarettes per day), and moderate to high (≥15 or ≥20 cigarettes per day).

左 : 受動喫煙なし、
 中 : 軽～中度曝露 (1～14本、1～19本／日)
 右 : 中～高度曝露 (15本以上、20本以上／日)

米国公衆衛生総監報告書2006のためのメタアナリシス

Major Conclusions

4. The scientific evidence indicates that there is no risk-free level of exposure to secondhand smoke.

米国公衆衛生総監報告(2006)の主要な結論
 4. 受動喫煙に安全なレベル (閾値) は存在しない

受動喫煙の前後で、特に、
 非喫煙者に大きな影響が発生。
 →安全なレベル (閾値) はない

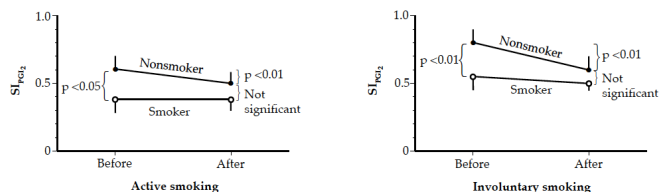
2006, p52

循環器系疾患への影響

2006年報告書, p53

・血小板凝集能 (短時間の受動喫煙でも影響あり)

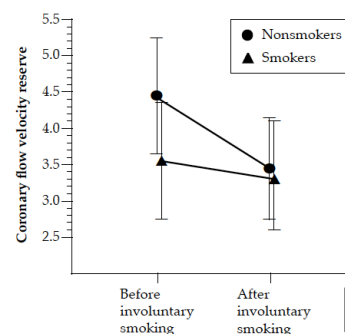
Figure 2.4 Effect of active and involuntary smoking on platelet aggregation in smokers and nonsmokers



Note: The sensitivity index, SI_{pca2} , is defined as the inverse of the concentration of prostaglandin I_2 which is necessary to inhibit adenosine diphosphate-induced platelet aggregation by 50 percent. Lower values of SI_{pca2} indicate greater platelet aggregation. Source: Burghuber et al. 1986. Adapted with permission.

・タバコ煙曝露による冠動脈血流速度の低下

Figure 2.6 Coronary flow velocity changes before and after secondhand smoke exposure



2006, p57

Conclusions 循環器系疾患の結論

1. The evidence is sufficient to infer that exposure to secondhand smoke has a prothrombotic effect.
2. The evidence is sufficient to infer that exposure to secondhand smoke causes endothelial cell dysfunctions.
3. The evidence is sufficient to infer that exposure to secondhand smoke causes atherosclerosis in animal models.

1. 科学的証拠により、受動喫煙は血栓形成促進効果を亢進させることは明らか
2. 受動喫煙により血管内皮の機能が障害されることが明らか
3. 動物実験でも動脈硬化を促進させることが明らか

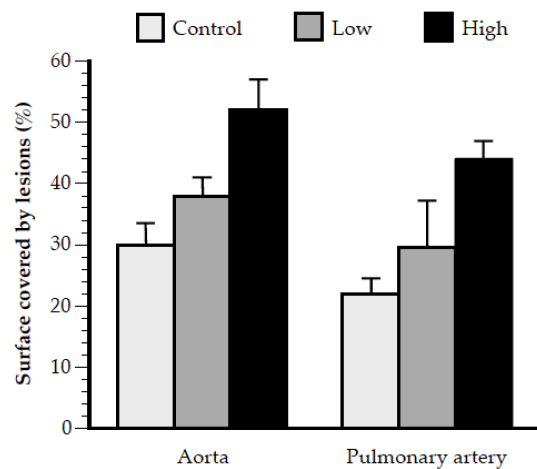
Major Conclusions

4. The scientific evidence indicates that there is no risk-free level of exposure to secondhand smoke.

米国公衆衛生総監報告(2006)の主要な結論
4. 受動喫煙に安全なレベル(閾値)は存在しない

動物実験でも受動喫煙曝露による悪影響

Figure 2.7 Secondhand smoke exposure and lipid deposits in rabbits



Note: Exposure to secondhand smoke increased lipid deposits in arteries of rabbits in a dose-dependent manner. Bars are for controls (clear air), and low doses and high doses of secondhand smoke exposures. Error bars represent standard error of the mean. Source: Zhu et al. 1993b. Reprinted with permission.

呼吸器系疾患(と循環器疾患)のメカニズムから「受動喫煙の曝露に安全閾は存在しない」と考えられる

functioning of the heart, blood, and vascular systems in ways that increase the risk of a cardiac event. Furthermore, many of these acute and chronic changes in blood and vascular function appear to be as large as those seen in active smokers. The immediate effects in some measures of blood and vascular functioning among nonsmokers from even brief exposures (i.e., 30 minutes or less) to secondhand smoke are comparable in magnitude to the effects observed in active smokers. Thus, the evidence reviewed in this chapter supports the biologic plausibility of adverse cardiovascular health outcomes that are associated with exposure to secondhand smoke, which are reviewed in Chapter 8.

As the portal of entry for secondhand smoke, the respiratory system is the initial site of deposition for the particulate and gaseous compounds found in secondhand smoke. This chapter identifies the multiple mechanisms by which secondhand smoke exposure can induce both acute and chronic adverse health effects within the respiratory tract that affect infants, children, and adults. The evidence for underlying mechanisms of respiratory injury from exposure to secondhand smoke suggests that a safe level of

exposure may not exist, thus implying that any exposure carries some risk. For infants, children, and adults with asthma or with more sensitive respiratory systems, even very brief exposures to secondhand smoke can trigger intense bronchopulmonary responses that could be life threatening in the most susceptible individuals.

Animal and human studies indicate that prenatal and postnatal exposure to nicotine and other toxicants in tobacco smoke may affect the neuroregulation of breathing, apneic spells, and sudden infant death. Experimental data on the neurotoxicity of prenatal and neonatal exposure to nicotine and secondhand smoke in animal models can be related to several potential causal mechanisms for SIDS, including adverse effects on brain cell development, synaptic development and function, and neurobehavioral activity. Finally, studies have documented that exposure to tobacco smoke from active smoking has a broad effect on immune function and host defenses against infectious agents. Evidence indicates that exposure to secondhand smoke appears to also impair immune function in both children and adult nonsmokers, which increases susceptibility to infection.

Major Conclusions

- Children exposed to secondhand smoke are at an increased risk for sudden infant death syndrome (SIDS), acute respiratory infections, ear problems, and more severe asthma. Smoking by parents causes respiratory symptoms and slows lung growth in their children.

米国公衆衛生総監、2006年報告の主要な結論

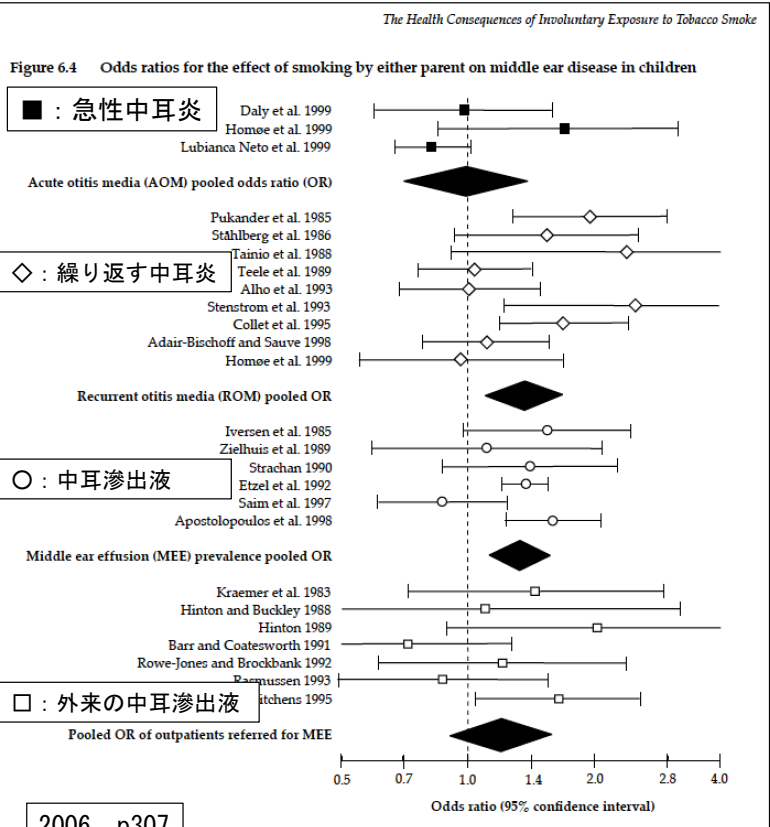
- 乳幼児突然死症候群、急性呼吸器症状、**耳鼻科疾患**、重症化する喘息は受動喫煙と明らかな因果関係がある。
両親の喫煙は呼吸器症状の原因となり、かつ、小児の肺の発達障害の原因となる。

Conclusions

- The evidence is sufficient to infer a causal relationship between parental smoking and middle ear disease in children, including acute and recurrent otitis media and chronic middle ear effusion.
- The evidence is suggestive but not sufficient to infer a causal relationship between parental smoking and the natural history of middle ear effusion.

両親からの受動喫煙が小児期の

- 急性、繰り返す中耳炎、滲出性中耳炎のリスクとなることは明らか
- 中耳疾患の発生の原因となることが示唆



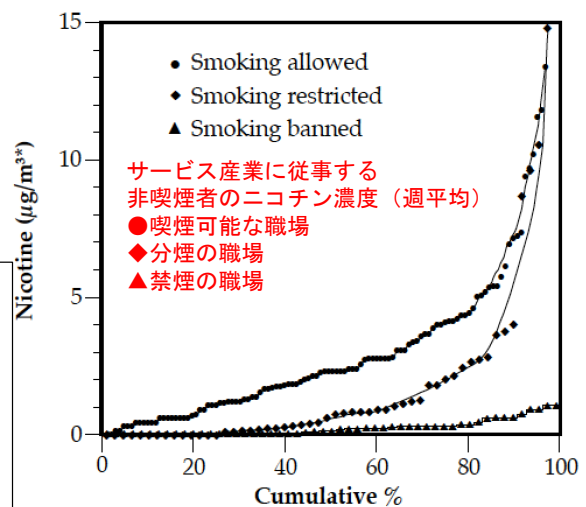
Major Conclusions

- Many millions of Americans, both children and adults, are still exposed to secondhand smoke in their homes and workplaces despite substantial progress in tobacco control.
- Eliminating smoking in indoor spaces fully protects nonsmokers from exposure to secondhand smoke. Separating smokers from nonsmokers, cleaning the air, and ventilating buildings cannot eliminate exposures of nonsmokers to secondhand smoke.

米国公衆衛生総監、2006年報告の主要な結論

- 喫煙対策は進んだものの、多くのアメリカ人（成人、小児）が家庭で、職場で受動喫煙に曝露されている。
- 受動喫煙の防止には、屋内完全禁煙が必要。区域分け、自然換気、強制換気などの、いわゆる「分煙」では受動喫煙を防止出来ない。

Figure 10.10 Cumulative frequency distributions of weekly average nicotine concentrations in nonsmokers' work areas in shops and other nonoffice settings



2006, p647

A Report of Surgeon General

(米国公衆衛生総監報告＝日本の厚生労働大臣)

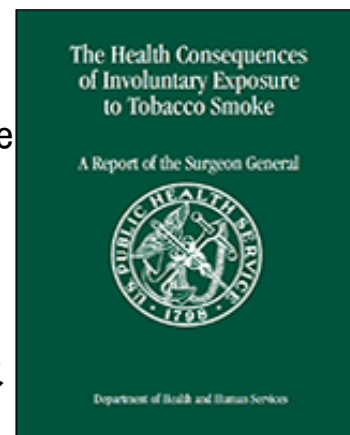
“The health consequences on involuntary exposure to tobacco smoke” (2006)

「受動喫煙に起因する健康影響に関する結論」

“The debate is over. The science is clear”

「(有害性に関する)議論は終わった。科学的証拠は明白」でプレスカンファレンスは始まり、以下が述べられた

- ・ 受動喫煙は深刻な健康被害をもたらす
- ・ 受動喫煙は危険である
- ・ 受動喫煙に安全なレベル(閾値)は存在しない
- ・ 数百万人の非喫煙者(米国人)が受動喫煙に曝露されている
- ・ すべての人が受動喫煙に曝露されない権利を有する
- ・ 無煙の環境を作ることが必要
- ・ 小児科医は子ども達を自宅での受動喫煙から守るために、家庭環境の無煙化を進めねばならない(気管支喘息、乳幼児突然死症候群の観点)



Conclusions

屋内全面禁煙の必要性に関する10の結論

＝受動喫煙防止には全面禁煙が必要

(2006年報告, p649)

1. Workplace smoking restrictions are effective in reducing secondhand smoke exposure.
職場の喫煙規制は受動喫煙軽減に有効
2. Workplace smoking restrictions lead to less smoking among covered workers.
職場の喫煙規制は喫煙者の喫煙本数の減少に繋がる
3. Establishing smoke-free workplaces is the only effective way to ensure that secondhand smoke exposure does not occur in the workplace.
屋内全面禁煙は受動喫煙完全防止の唯一の手段
4. The majority of workers in the United States are now covered by smoke-free policies.
現時点で、米国の多くの職場が屋内全面禁煙
5. The extent to which workplaces are covered by smoke-free policies varies among worker groups, across states, and by sociodemographic factors. Workplaces related to the entertainment and hospitality industries have notably high potential for secondhand smoke exposure.
サービス産業の全面禁煙化は遅れている
6. Evidence from peer-reviewed studies shows that smoke-free policies and regulations do not have an adverse economic impact on the hospitality industry.
サービス産業を全面禁煙化しても営業収入は減らない
7. Evidence suggests that exposure to secondhand smoke varies by ethnicity and gender.
人種と性により差が出ている
8. In the United States, the home is now becoming the predominant location for exposure of children and adults to secondhand smoke.
米国では、家庭が受動喫煙の曝露の場となっている
9. Total bans on indoor smoking in hospitals, restaurants, bars, and offices substantially reduce secondhand smoke exposure, up to several orders of magnitude with incomplete compliance, and with full compliance, exposures are eliminated.
完全禁煙と不完全な禁煙では数十万倍の差がある
10. Exposures of nonsmokers to secondhand smoke cannot be controlled by air cleaning or mechanical air exchange.
空気清浄機や強制換気では受動喫煙を防止できない

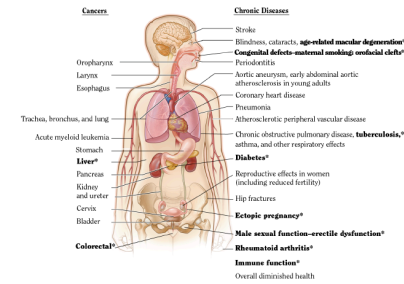
能動喫煙（左）と受動喫煙（右）により発生する疾患

2014報告より

The Health Consequences of Smoking—50 Years of Progress

Surgeon General's Report

Figure 1.1A The health consequences causally linked to smoking



Source: USDHHS 2004, 2006, 2012.
Note: Each condition presented in bold text and followed by an asterisk (*) is a new disease that has been causally linked to smoking in this report.

能動喫煙は、あらゆる病気の原因

Figure 1.1B The health consequences causally linked to exposure to secondhand smoke

Children

Middle ear disease
Respiratory symptoms, impaired lung function
Lower respiratory illness
Sudden infant death syndrome

小児

- ・ 中耳疾患
- ・ 呼吸器症状
- ・ 肺機能障害
- ・ 末梢気道疾患
- ・ 乳児突然死症候群

Adults

Stroke*
Nasal irritation
Lung cancer
Coronary heart disease
Stroke*
Nasal irritation
Lung cancer
Coronary heart disease

成人

- ・ 脳卒中
- ・ 鼻刺激症状
- ・ 肺がん
- ・ 心血管疾患
- ・ 女性の生殖機能（低出生体重児）

Source: USDHHS 2004, 2006.

Note: Each condition presented in bold text and followed by an asterisk (*) is a new disease that has been causally linked to exposure to secondhand smoke in this report.

A Report of Surgeon General（米国公衆衛生総監報告）
“The health consequences of smoking
– 50 Years of Progress”（2014年報告）
「喫煙による健康影響：50年間の進歩」

The Health Consequences
of Smoking—50 Years of Progress

A Report of the Surgeon General



U.S. Department of Health and Human Services

1964年のSurgeon General's report 後、
成人喫煙率は43%(1965年)→18%(現在)まで低下したが、
いまだに、米国では毎年4000万人が新たな喫煙者＝脅威に変わらない

本報告の10の結論は以下の通りである。

- 1) 1世紀にわたるタバコの流行は、本来、**予防できたはずの公衆衛生上の悲劇**をもたらした。
1964年の米国公衆衛生総監報告以降も2000万人の早世をもたらした。
- 2) タバコ産業がもたらしたタバコ疫病は、現在も続いている。そのために、**タバコ産業は、喫煙の被害を計画的に過小評価させることで国民をミスリードする、という積極的な戦略をおこなってきた。**

A Report of Surgeon General (米国公衆衛生総監報告)
“The health consequences of smoking
– 50 Years of Progress” (2014年報告)
「喫煙による健康影響：50年間の進歩」

The Health Consequences
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- 3) 1964年のSurgeon General’s report 後、喫煙はほぼすべてのがんの原因であること、健康状態を悪化させること、胎児に悪影響があることが判明した。最初の本報告から50年後の現在でも、これまで無関係とされていた疾病、つまり、**糖尿病や関節リウマチ、大腸癌**などが喫煙と関連することが明らかとなりつつある。
- 4) **受動喫煙が（非喫煙者の）発がん、呼吸器疾患、心疾患の原因となること、および、乳幼児や小児の健康に悪影響を及ぼすことが明らかとなった。**
- 5) 過去50年で女性の喫煙者が急増した結果、現在、喫煙による**女性の被害（肺がん、COPD、心疾患）**は、男性と同程度に増加した。
- 6) 喫煙は、多くの疾患の原因になるだけでなく、**全身の炎症、免疫機能の障害**などの悪影響が発生することが分かった。

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- 7) 1964年以降、喫煙率は減少したが、**人種や教育レベル、社会経済的要因（貧困）により、喫煙率の不均衡（高い集団）**が米国全体に残っている。
- 8) 1964年の本報告以来、包括的な喫煙対策が取られたことでタバコの使用が効果的に減少したことが証明されてきた。**さらに強力な喫煙対策**を継続することで、より大きな効果が期待される。
- 9) タバコ、その他のタバコ製品の使用が、早世と疾病として米国社会にもたらした負担は**莫大**なものである。**タバコ・タバコ製品を消滅**させることで、社会的な負担は急速に減少する。
- 10) 喫煙と健康（への悪影響）に関する**50年間の本報告**は、タバコの消費量を減らし、喫煙関連疾患と早世を予防するための**公衆衛生活動**に重大で科学的な根拠を提供してきた。