A STUDY OF ODOR AND IRRITANT EFFECTS IN A POPULATION RESIDING NEAR A BARREL AND PAIL MANUFACTURING PLANT IN JERSEY CITY

APPENDICES A - H

Appendix A

List of Chemicals Reported by Van Leer Containers Company

VAN LEER CONTAINERS, INC.

353 DANFORTH AVENUE
JERSEY CITY, NEW JERSEY 07305

201/333-4700

June 14, 1984

Hudson Regional Health Commission
313 Harrison Avenue
Harrison, N. J. 07029

Gentlemen:

In our coating operations we apply numerous coating materials to the interior and the exterior of the containers which we produce. To the interior of a container we apply over 30 coatings from eight different vendors. Each coating has a different solvent blend. To the exterior of a container there are at least 100 different colors, again with differing solvent blends. Which coatings are applied to a container are specified by the customer.

Given the above complexities of the coating operations, it is impossible to list by weight or percentage each solvent emitted. However, for the purposes of the permit requirements, we can list the following solvents as possible emissions from the coating operations:

Methyl ethyl ketone	Methyl dioxitol
Toluene	Mineral spirits
Xylene	Isopropanol
Solvesso 100	Butyl Cellosolve
Solvesso 150	Acetone
Butanol	Isobutanol
Ethanol	Isobutyl acetate
Isophorone	Cyclohexanone
Cellosolve	Butyl acetate
Cellosolve acetate	Diacetone alcohol
Methyl isobutyl ketone	VM&P naphtha

Very truly yours,

L C Heckler

L. C. Heckler
Plant Manager

em

VAN LEER CONTAINERS, INC. EMISSIONS SUMMARY

SOURCE: COMPANY SUPPLIED DATA
1985 TO 1988 H.R.H.C. SOURCE REGISTRATION

STACK#	SOURCE NAME	ACTUAL EMISSIONS LBS/HR	X HRS/DAY	X DAYS/WK	= LBS/WEEK
1	Drum Parts Booth	29	9	5	1305
2	Interior Side Seam Booth (Pail)	3	1	2	6
3	Drum Touch Up Booth	4	1	3	12
4	Drum Chime Booth	8	9	5	360
5	Drum Lining Machine	34	4	5	680
6	Drum Paint Booth	71	9	5	3195
7	Ext. Side Seam Booth (Pail)	3	2	5	30
8	Pail Paint Booth	51	13	5	3315
9	Double Oven Paint Booth (Pail)	9	15	5	675
10	Deleted (Single Oven Lacquer)	-	-	-	-
11	Double Oven Lacquer Booth (Pail)	9	15	5	675
17	Pail Incinerator	7.2	12	5	432
18	Litho Incinerator	27.2	10	5	1360
					12045

Total emissions reported per 5 day work week 12,045 lbs.

Average emissions per day = 12045/5 = 2,409

FROM; N.J.D.E.P. Documentation for Sources Emitting VOS from Surface Coatings:

Company Designation of Stack	Emission Rate lb/hr (Actual)
Pail paint line	180.1
Drum Paint line	147.0
Drum parts (booth & Oven)	34.9
Drum centrifugal #1	100.4
Drum centrifugal #2	100.4
Parts DOP	37.0
Parts DOL	27.2
Parts SOL	27.2
Pail lining line	74.6
Drum litho line	45.2

FROM: H.R.H.C. Emission Source Application Data Sheet:

Company Source I.D.	Emission Rate lb/hr (Actual)
PPB Pail paint booth	51
DLM Drum lining machine	34
DPS Drum parts booth	29
DPB Drum paint booth	71
DTU Drum touch up booth	4
DCS Drum chine booth	8
ISS Interior side seam booth	3
ESS Exterior side seam booth	3
DOP Double oven paint booth	9
SOL Single oven lacquer booth	9
DOL Double oven lacquer booth	9

VAN LEER CONTAINERS, INC.

4300 WEST 130TH STREET
CHICAGO, ILLINOIS 60658

312/568-3535

October 10, 1985

Mr. Ode Keiderling
State of New Jersey
Dept. of Environmental Protection
John Fitch Plaza - C.N. 027
Trenton, N. J. 08625

Dear Mr. Keiderling:

Please find enclosed a copy of an Addendum to Report BJF 111.

Sincerely,

Brian J. Farmer

Brian J. Farmer
Laboratory Director

Enc.

/afs

VAN LEER CONTAINERS, INC.

October 10, 1985

Addendum to Report BJF 111

1. Progressive reduction of emissions between January 1 and April 30, 1987.

1.1 By January 31, 1987

It is anticipated that the new operation will be undergoing a debugging period during this month and that only 10% of the sprayed drum production will be made in the new factory during January.

1.2 By February 28, 1987

As the new operation improves, a further 20% of sprayed drums will be transferred.

1.3 By March 31, 1987

A further 30% will be transferred.

1.4 By April 30, 1987

The remaining 40% will be transferred, thereby enabling the complete close down of the spray finishing lines at Danforth Avenue.

2. Material Usage 1984

Varnish	6,426	gallons
Roll Coating	12,441	"
Spray Paint	98,282	"
Internal Lacquer	68,669	"
Solvent (Thinner)	53,179	"

3. Solvent (Thinner) Usage

Ethyl Alcohol	16,618	gallons
Xylene	19,187	"
MEK	12,983	"
Cellosolve	4,116	"
Solvesso 150	55	"
Solvent Naphtha	220	"
	53,179	

4. Solvent Type Used With Major Offtake Colors

4.1 127-1 Black Spray Enamel

Annual usage 1984	38,820 gallons
Percent non-volatiles, as received	37.6% by weight

Solvent breakdown:

Mineral Spirits	14.0% by weight
VM&P Naphtha	49.0% " "
Solvesso 150	3.0% " "
Toluene	2.0% " "
n Butanol	21.0% " "
Ethyl Benzene	4.0% " "
P.M. Acetate	7.0% " "

Typical thinning:

81.4% paint + 18.6% xylene by volume.

4.2 859-1 White Spray Enamel

Annual usage 1984	13,972 gallons
Percent non-volatiles, as received	54.2% by weight

Solvent breakdown:

Xylene	69.2% by weight
Toluene	4.8% " "
Lactol Spirits	15.0% " "
n Butanol	11.0% " "

Typical thinning:

80.6% paint + 19.4% xylene by volume.

4.3 403-1 Grey Spray Enamel

Annual usage 1984	8,235 gallons
Percent non-volatiles, as received	47.3% by weight

Solvent breakdown:

Xylene	63.1% by weight
Toluene	18.9% " "
Solvesso 150	3.1% " "
n Butanol	9.3% " "
Lactol Spirits	

Typical thinning:

84.2% paint + 15.8% xylene by volume.

4.4 859-5 White Roller Coating

Annual usage 1984	8,357 gallons
Percent non-volatiles, as received	67.0% by weight

Solvent breakdown:

Propylene Glycol Ether	54.6% by weight
Solvesso 150	33.4% " "
Butyl Cellosolve	1.0% " "
Xylene	1.0% " "
n Butanol	1.0% " "

Typical Thinning:

88% paint + 12% cellosolve*.

*Cellosolve no longer in use - have converted to Ektasolve EP.

B. J. Farmer

Appendix B

Report on Air Quality near Van Leer Container Company - Jersey City

Office of Science and Research
New Jersey Department of Environmental Protection
April 14, 1986

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF SCIENCE AND RESEARCH
CN 402, TRENTON, N.J. 08625

THOMAS A. BURKE, M.P.H.
DIRECTOR

MEMORANDUM

TO: Those Listed

THROUGH: Thomas A. Burke, Ph.D., M.P.H., Director
Office of Science and Research

FROM: Ronald Harkov, Ph.D.

SUBJECT: Report on Air Quality near Van Lear Container Company - Jersey City

DATE: April 14, 1986

Attached you will find a copy of a report from the monitoring results collected during the Office of Science and Research study in the vicinity of Van Lear Container Company - Jersey City. Our monitoring group has already presented an earlier version of this report to Mr. Ode Keiderling of DEQ and Dr. Terry Shahata of DOH and have incorporated any recommended changes that were made at our meeting on 4/9/86. This report will be presented at the APCA/EPA conference on Air Toxics Monitoring on 4/28/86. Prior to this conference, Mr. John Jenks of our office will present an informal seminar on the study on 4/22/86 at 2:00 PM in the 2nd floor conference room in the Carroll Building. You and your staff are invited to attend this seminar.

Please feel free to contact me at 4-2207 if any further assistance on this matter is required.

km
Attachment
c: D. Deieso, DEQ
K. Rosenman, DOH
R. Fenaiudo, HCRHC
T. Shahata, DOH
A. Edwards, DEQ

Industrial Emission Impacts in the New Jersey Environment: Results from a Study Near a Barrel and Pail Manufacturing Plant

John Jenks - Office of Science and Research, NJ Dept. of Environmental
R. Harkov Protection, CN-409, Trenton, NJ 08625
C. Ruggeri

Abstract

Industrial emissions can have a significant impact on localized air quality in many urban areas. Many older urban/industrial areas contain manufacturing plants in close proximity to residential areas and which do not possess adequate air pollution control devices to minimize emissions. The present report summarizes the monitoring results obtained in the vicinity of a steel barrel and pail manufacturing plant in Jersey City, NJ. Local residents have complained of odors, headaches and nose bleeds from emissions from this plant. Although the surface coating materials utilized by the facility do not contain known carcinogens, these substances (xylenes, methylethylketone, acetone, butanol, etc.) are known to have relatively low odor thresholds. A sampling scheme was developed to obtain upwind, downwind and maximum impact data resulting from the emissions from this facility. All fixed site samples (4 hrs.) were collected on glass cartridges containing 1.1 gm Tenax-GC utilizing Nutech-221-1MC sampling pumps, while DuPont-Alpha-1 personal monitoring pumps were utilized to collect short-term (15 min.) peak levels of the selected substances. Cartridges were analyzed by thermal desorption into a HP 5995 GC/MS, equipped with a volatile organic column. The entire study was conducted utilizing a mobile laboratory (MMU) specially designed for thermal desorption - GC/MS analyses. Results from this monitoring effort indicate that levels of selected solvents measured in the community near the barrel and pail plant were not in excess of published odor thresholds. However, it was clearly demonstrated that the manufacturing facility caused localized degradation of air quality.

INTRODUCTION - Volatile organic compounds (VOC) are thought to be of some environmental importance because of their role in: a) carcinogenesis, b) ozone formation, and c) smog aerosol formation (Harkov et al 1983, NAS 1977). In addition to these impact areas, VOC can be of localized significance as a nuisance (odor causing agent) and/or as an irritant if emitted by specific industrial sources. Some VOC that have particularly low odor threholds and also may cause a hypersensitive response in a portion of a population include: aldehydes, ketones and organic acids (Verschueren 1983, Keg et al 1977, Fay and Billings 1980). In the present context VOC are delimited as those substances with a vapor pressure greater than or equal to 0.02 psi.

Industrial impacts on localized VOC levels have been seldom reported in the technical literature (Sexton and Westberg 1980, Pellizari, 1982). Odor related VOC emission impacts also have been reported infrequently in the air pollution literature (Van Langenhose et al 1982). In New Jersey, studies have been conducted on the levels of selected VOC at urban and rural background locations (Harkov et al 1981, Harkov et al 1983, 1984) and most recently at site specific locations such as Superfund sites (Harkov et al 1985) and sewage treatment plants (Harkov et al 1986). Industrial based investigations of VOC in New Jersey have recently been initiated utilizing a

mobile monitoring unit (MMU) (Haggert and Harkov, 1985). The present report contains results from an air quality investigation near a steel barrel and pail manufacturing facility in Jersey City, New Jersey. This facility has caused localized odor and irritant problems in the nearby neighborhood and grade school.

METHODS

Description of Facility - The barrel and pail manufacturing operations (VLCC) is located in a residential area in Jersey City, New Jersey (Figure 1). The plant fabricates and paints pails and barrels with a normal daily production rate of 3,500 and 15,000 respectively. Coatings are put on the products by VLCC using paint spray, lacquer spray and lithograph roller booths. The lithograph and part of the pail lines are vented to two separate exhaust incinerators. The VLCC facility is more than 100 years old and is currently updating equipment to comply with NJ VOC codes. Odors resulting from the facility can be detected as far as 2 km from the manufacturing site. Hudson County Regional Health Commission (HCRHC) have attributed typical irritation reactions (eye tearing, and headaches) to local odors in the residents living adjacent to the site and in children attending a nearby grade school. According to the records of the HCRHC the paint products utilized by VLCC contain at least the following solvents: acetone, methylethylketone, methylisobutylketone, butanol, ethanol, isopropanol, butylacetate, ektasolve, xylenes and toluene.

Sampling Design - All sampling took place during November 1985. Four permanent sampling sites were located at approximately 90° apart as indicated in Figure 1. All samples collected at these sites were for 4 hr. in duration and nine days of samples were collected simultaneously at each site. Site #5 was located within the school building. Short term (1½ hr.) and grab samples (15 min.) were collected on the same days as the fixed site samples to try to characterize transient, peak concentrations. A total of 11 grab and 6 short term samples were collected during this study. A meteorological station (wind speed and direction, temperature) was installed on the roof (2nd story) of the church adjacent to VLCC.

Sample Collection and Analysis - Fixed site samples (4 hr.) were collected at a flow rate of 60 ml/min with Nutech-221-1MC air pumps equipped with 1.1 gm Tenax-GC (60/80 mesh) loaded glass cartridges. Grab samples (15 min.) were collected at a flow rate (1 L/min) utilizing identical cartridges as described above, but with DuPont-Alpha-1 personal monitoring pumps. Short term samples (1½ hr.) were collected at a flow of (200 ml/min) with the DuPont-Alpha-1 pumps.

All analyzes occurred in the MMU equipped with a Hewlett-Packard 5995 GC/MS. The MMU has been previously described by Haggert and Harkov (1985). Prior to thermal desorptions four internal standards were added to the cartridges (bromodichloromethane, 1-chloro-2-bromopropane, 4-bromofluoro-benzene, and 1,4- dichlorobutane). The Tenax-GC cartridges were then thermally desorbed at 225°C with a 25 ml/min He flow into a cryofocusing trap maintained at -148°C. The sample was heated, then injected onto a 60/80 mesh carbopack-B, 0.1% SP-1000 glass column (2.4M x 1/8" ID). Oven temperatures began at 40°C and were raised to 236°C at 14°C/min. The mass spectrometer scanned 35-320 amu. All cartridges were analyzed within 72

hours of sampling. Statistical analyses were carried out utilizing Statgraphics (STSC 1981).

Quality Assurance/Quality Control - During the course of this study a number of qa/qc steps were carried out. These procedures included the use of internal standards, calibration curves, field blanks, laboratory blanks, and tandem and duplicate cartridges. Prior to sampling, thermal flexing of the Tenax-GC resin was accomplished for all cartridges utilizing a triplicate 2 hour heating/cooling cycle followed by thermal desorption (Nutech 340-14). Precision estimates based on analysis of compounds on 5 duplicate cartridges were approximately ±24.3% at the 95% confidence interval. The minimum detection limits (MDL) were set at approximately three times the signal to noise ratio, while the minimum quantitation limits (MQL) were set at 2.5 times MDL. The MDL's varied from 0.07 ppbv (25°C, 760 mm) for toluene and ethylbenzene to 0.64 ppbv for ethanol. It should be noted that according to the Brown and Purnell (1979) report breakthrough was probably significant for acetone, ethanol and isopropanol. Breakthrough for these substances is estimated using tandem cartridges (N=4) to be on the order of 30%. It is thus reasonable to conclude that the levels for these three compounds are underestimated in this study.

Results - The monitoring information is presented on a site and upwind/downwind bases in Tables 1 and 2. Concentrations of perchloroethylene (perc) were also included in this study as an example of a ubiquitous urban VOC which was not utilized by VLCC. The highest VOC levels were generally recorded in grab samples, while location #2 had the most significant concentrations of the four fixed sites. Most VOC levels in the school were 50% or less than the nearby fixed site (#3) when ambient levels were significant (5-10 fold increase) as compared to periods when the plant impacts were small. Thus indoor/outdoor (I/O) ratios were nearly 1 during non-impact periods. However, the same compounds were identified in all samples within the school and in the adjacent communities. Downward samples were significantly elevated over upwind samples, particularly for ethanol, acetone, methylethylketone, ethylbenzene, and xylenes. The highest individual fixed site and short term samples are shown in Table 1.

Pairwise correlations (Table 3) indicate that most of the solvents thought to result from VLCC emissions are highly correlated ($R \geq 0.70$), while none are related to perc. Factor analysis was carried out to identify those parameters which can explain the ambient data set and this effort resulted in a five-factor model (Table 4).

Discussion - Virtually all of the solvents reportedly utilized by VLCC and measured in the ambient air adjacent to the facility are known for their acute toxicity (Sax 1983). Levels of the twelve solvents measured during the present study were significantly below reported odor thresholds, although individual samples had total solvent concentrations above the odor thresholds of specific materials such as m-xylene (270 ppb_v) and isopropanol (130 ppb_v). Generally concentrations for selected VOC in grab samples were greater than fixed site samples, but were not more than 2 times the levels found at fixed sites. In spite of the levels of selected solvents found during this study, field personnel from the MMU experienced typical irritant responses when strong odors were detected off site, and near the plant boundaries. Because unknown organic compounds were not the focus of this

study, it is uncertain whether high levels of other odorous materials were being emitted from VLCC. This issue is of particular concern for lightweight organics that are poorly trapped by the Tenax-GC adsorbent utilized in the present effort.

Many of the pollutants measured in the current study have been quantified in ambient air in urban portions of New Jersey. Levels of alkylbenzenes and perchloroethylene in the urban atmosphere of New Jersey have been recently reported (Harkov et al 1983, Harkov et al 1984). Both methylethylketone and methylisobutylketone were measured at a number of urban New Jersey sites during 1979, but were generally found at concentrations less than 0.01 ppbv (Harkov et al 1981). Utilizing ATEOS data as a comparison, significant increases over background VOC levels resulting from the facility were considered when VLCC/Newark ratios exceeded a factor of 3, which was the case for ethylbenzene and xylenes, but not for toluene and perc (Table 5). A comparison of upwind/downwind concentrations indicates that VLCC had significant impacts on localized air quality for ethanol, ektasolve, acetone, methylethylketone, ethylbenzene, xylenes and isopropanol when using a three-fold increase over background as the basis for this conclusion (Table 2). The failure to detect impacts on butylacetate and toluene levels from VLCC is probably a reflection of the lower level of use of these substances at this facility and the high background concentration of toluene in urban air. It should be noted that because of the high population and industrial density, it was expected that VOC levels in Jersey City would be slightly higher than in Newark and also that the shorter sampling times utilized in the present study would tend to produce somewhat higher levels than the 24 hour Newark samples.

The pairwise correlation matrix indicates that those substances utilized by VLCC were highly correlated, but not with perc which was not a solvent utilized at this facility (Table 4). While the pollutant levels for those substances were moderately correlated (R = 0.50) with position of sample collection (upwind/downwind), there was no such relationship for perc. This result is consistent with the observation that perc is a ubiquitous urban contaminant, but that VLCC is impacting localized air quality for a select group of solvents utilized in its internal processes.

Factor analysis was carried out to identify those issues which have the most impact on the correlation between the variables in the data set. Ideally, factor analysis should be carried out on large (>75 obs) data sets (Lioy et al, 1985) and the 57 observations from the current effort are great enough to draw some preliminary conclusions. A five factor model (Table 5) which explained about 94% of the variance in the model was produced from this data set. The first factor includes acetone, ethylbenzene, xylenes, isopropanol and butanol and is most likely related to a specific spray coating operation and the solvents associated with this process within VLCC. The second factor had high loadings of methylethylketone, methylisobutylketone, and ektasolve, which are the main solvents utilized in the roller operations at VLCC. Both toluene and butylacetate were highly loaded on factor three which is probably related to the influence of background levels. Factor four has high loadings of perc and location which is indicative of the relative distance of the fixed and grab sites to the nearest dry cleaning operations on Fowler and Danforth Avenues. Finally,

the fifth factor is related to upwind/downwind positions and was important for influencing the recorded concentrations.

By utilizing perc as a marker for ubiquitous urban VOC contaminants, it can be shown that VLCC clearly had an impact on localized air quality in this portion of Jersey City (Figures 2 and 3). The levels of perc near VLCC were: a) typical of urban concentrations (Singh et al 1981, 1982), b) not effected by wind direction, c) poorly correlated with the other VOC measures, and c) location of sample collection was the only variable in the data set which could partially explain the measured perc trends. The results for the ketones, alkylbenzenes and alcohols are directly opposed to those of perc and demonstrate that VLCC has a measurable impact on localized air quality.

As a final comment it is unclear whether the sample collection period of November 1985 corresponded with typical operations at VLCC. The plant personnel were aware of the presence of a sampling crew in the vicinity of the facility. Also, the HCRHC claimed that the odors were relatively mild during the present study compared to other periods during the past few years. For lack of better information, the data presented here in this report should be considered representative of off-site VOC impacts near VLCC.

Conclusions - Ambient VOC data was collected to document the impact of emissions from a steel barrel and pail manufacturing facility on localized air quality in Jersey City, New Jersey. This facility was shown to cause increases in selected VOC from 3 to 30 fold over background levels. These solvents corresponded to those utilized during coating operations at this facility. In spite of demonstrating the impact of this facility on localized air quality, odor thresholds reported in the literature for individual compounds were not exceeded in any samples. Whether other materials that were not measured during this study contribute to the localize odor and irritant problem is not known. However, these data indicate that for short periods of time total solvent concentrations can exceed odor thresholds for specific compounds.

Acknowledgements - The authors would like to thank the Hudson County Regional Health Commission, particularly Mr. John Demjanick and Mr. Gary Garetano, for assistance during this study. A special thanks to all the local citizens who provided site access for sample collection during this effort.

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Table 1 - Concentrations of Selected VOC near VLCC by site (ppb_v, X±STD)

POLLUTANT	1	2	3	4	5	6	Max.[c] 4/hr Sample	Peak Grab Sample
ethanol	15.2±19.1	10.3±8.0	4.4±4.4	10.1±20.8	4.7±4.3	25.3±27.6	60.7	NR[b]
isopropanol	9.5±7.7	18.9±15.8	9.9±8.1	10.9±14.6	11.6±7.5	33.9±38.3	45.6	110.0
butanol	10.5±11.0	15.4±11.3	7.3±6.2	10.3±11.4	5.9±3.0	24.6±19.1	37.3	62.8
acetone	9.3±11.4	14.8±10.3	5.5±5.4	9.2±13.4	5.2±3.9	38.6±51.2	45.2	191.2
methylethyl-ketone	10.9±14.2	9.5±5.9	5.4±5.6	5.7±10.2	4.2±3.0	29.4±23.0	33.7	90.4
methylisobutyl-ketone	1.3±1.4	1.4±0.6	1.4±0.7	1.1±1.5	0.8±4.0	3.2±2	4.5	6.8
butylacetate	1.4.±1.1	1.7±.08	1.4±0.6	2.6±2.1	0.8±0.2	1.2±1.2	4.8	6.4
ektasolve[a]	2.7±4.7	2.2±1.9	1.2±2.8	1.7±3.8	1.5±2.1	8.8±7.7	13.3	26.7
toluene	8.1±7.6	8.7±4.7	5.3±2.9	5.5±4.4	5.7±1.8	12.4±6.6	21.8	24.1
ethylbenzene	6.2±7.7	7.2±6.6	4.0±4.7	2.9±4.9	2.1±2.0	10.1±8.1	16.7	33.1
m-xylene	10.9±17.4	12.0±16.0	3.8±8.0	5.7±13.8	4.8±5.1	31.1±24.2	42.5	89.5
o&p-xylene	9.4±12.2	9.8±16.8	4.9±6.5	4.1±8.9	3.2±2.7	18.0±12.8	27.5	48.3
perchloro-ethylene	0.8±.07	0.9±.08	1.0±.0.8	1.1±1.4	0.9±0.5	0.7±0.9	4.5	2.6
N[d]	11	10	10	9	6	11		
DESCRIPTION	Danforth Ave.	Greenville Ave.	Lembeck Dr.	Sullivan Dr.	School (indoor)	Grab		

a- Ektasolve = ethyleneglycol monopropylether
b- NR = Offscale
c- Max. = highest value in 40 samples
d- N = includes duplicates

Table 2 - Comparison of Upwind and Downwind Concentrations at VLCC
(ppb_v, $\bar{X}$±STD)

	UPWIND	DOWNWIND	RATIO (D/U)
ethanol	1.7±3.	23.0±23.4	13.5
acetone	4.9±4.	28.1±35.6	5.7
methyethylketone	2.7±2.5	23.0±18.0	8.5
methyisobutylketone	0.9±.07	2.5±1.7	2.8
butylacetate	2.0±2.8	1.8±1.0	0.9
ektasolve	0.2±0.4	6.7±6.1	33.5
ethylbenzene	0.6±1.0	10.0±6.7	16.7
toluene	5.1±2.9	11.9±6.3	2.3
m-xylene	0.9±0.9	26.0±20.4	28.9
o,p-xylene	0.9±1.0	16.3±11.5	18.1
butanol	6.5±5.3	22.1±15.2	3.4
isopropanol	6.0±7.0	26.7±27.7	4.5
perchloroethylene	0.9±0.8	0.8±0.7	0.9
N	13	25	

Table 3 - Pairwise Correlations for Selected VOC at VLCC

	ETOH	ACE	MEK	ETBZ	MXYL	PROP	PERC	LOC	POS
ETOH[a]	1	0.84	0.71	0.77	0.80	0.54	-0.18	-0.29	0.39
ACE		1	0.84	0.82	0.85	0.73	-0.29	-0.31	0.47
MEK			1	0.65	0.69	0.34	-0.28	-0.34	0.48
ETBZ				1	0.99	0.70	-0.42	-0.39	0.58
MXYL					1	0.71	-0.38	-0.36	0.61
PROP						1	-0.05	-0.11	0.39
PERC							1	0.60	-0.22
LOC								1	0.06
POS									1

a- ETOH - Ethanol
ACE - Acetone
MEK - Methylethylketone
ETBZ - Ethylbenzene
PROP - Isopropanol
PERE - Perchloroethylene
LOC - Location
POS - Position

Table 4 - Final Facto Analysis Solution for VOC from VLCC[a]

	Factor Loadings[b]				
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
ETOH	0.60				
ACE	0.75				
MEK		0.79			
MIBK		0.97			
BUTACE			0.89		
ETBZ	0.76				
TOL			0.71		
MXYL	0.76				
OPXYL	0.77				
PROP	0.97				
BUT	0.87				
PERC				0.91	
EKTA		0.84			
POS					0.86
LOC				0.82	

a- Principal Factor Analysis (PFA) was conducted on Stagraphics (1981) utilizing listwise deletion and varimax rotation.
b- Factor loadings greater than or equal to 0.60 are shown.

Table 5 - Comparision of Selected VOC Levels at VLCC and Newark (ppb_v)

	Newark - Winter 1982[a]	Ratios (VLCC/Newark)
perchloroethylene	0.46	1.8
ethylbenzene	0.51	12.4
o,m,p-xylenes[b]	2.23	10.9
toluene	4.93	1.4

a- From - Harkov et al (1984)
b- o,m,p-xylenes are combined due to the different isomeric separations on packed and capilliary columns utilized in both studies

Figures

Figure 1

VLCC and vicinity with fixed site locations

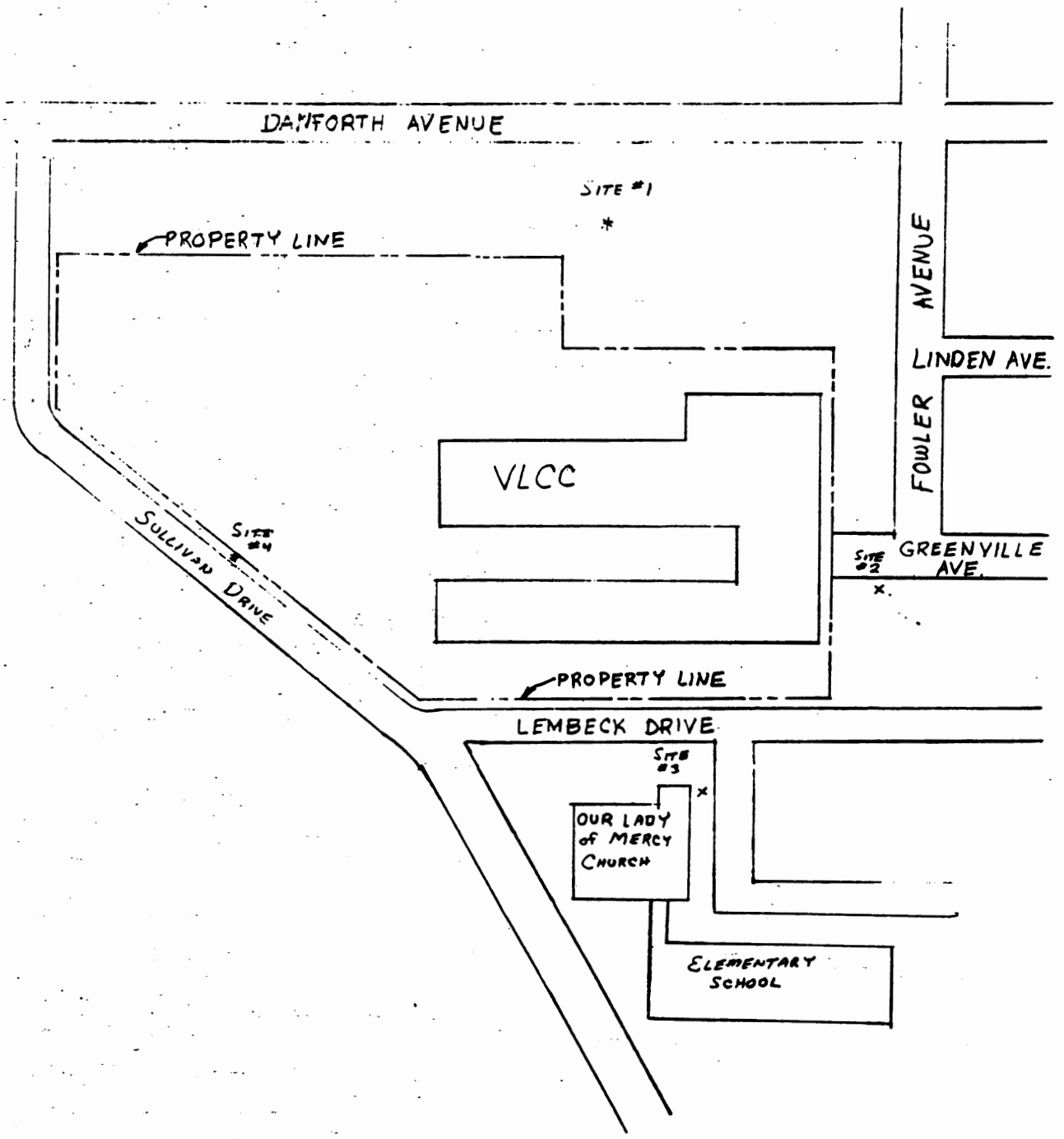


Figure 2

Upwind concentrations trends for m-xylene and perchloroethylene.

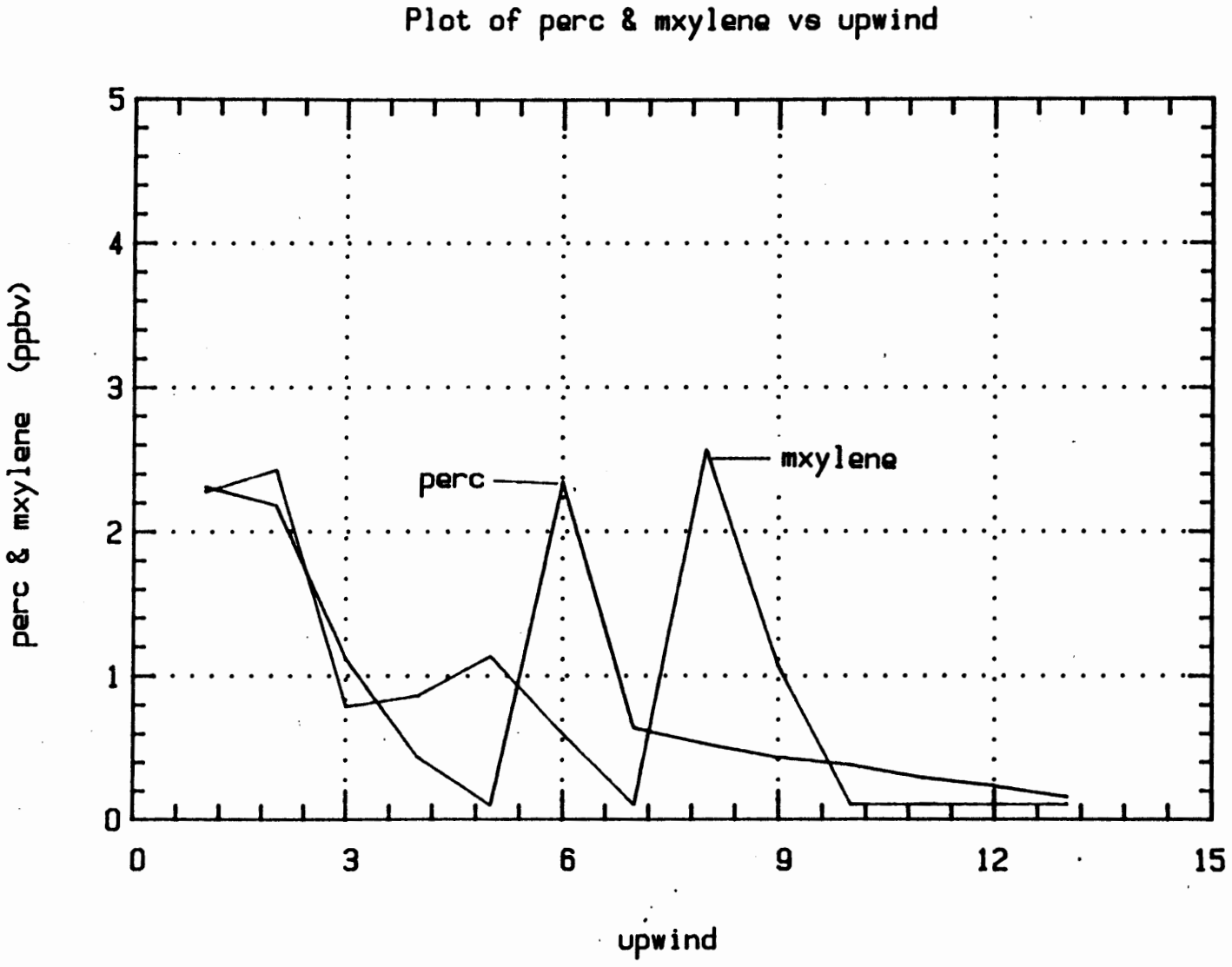
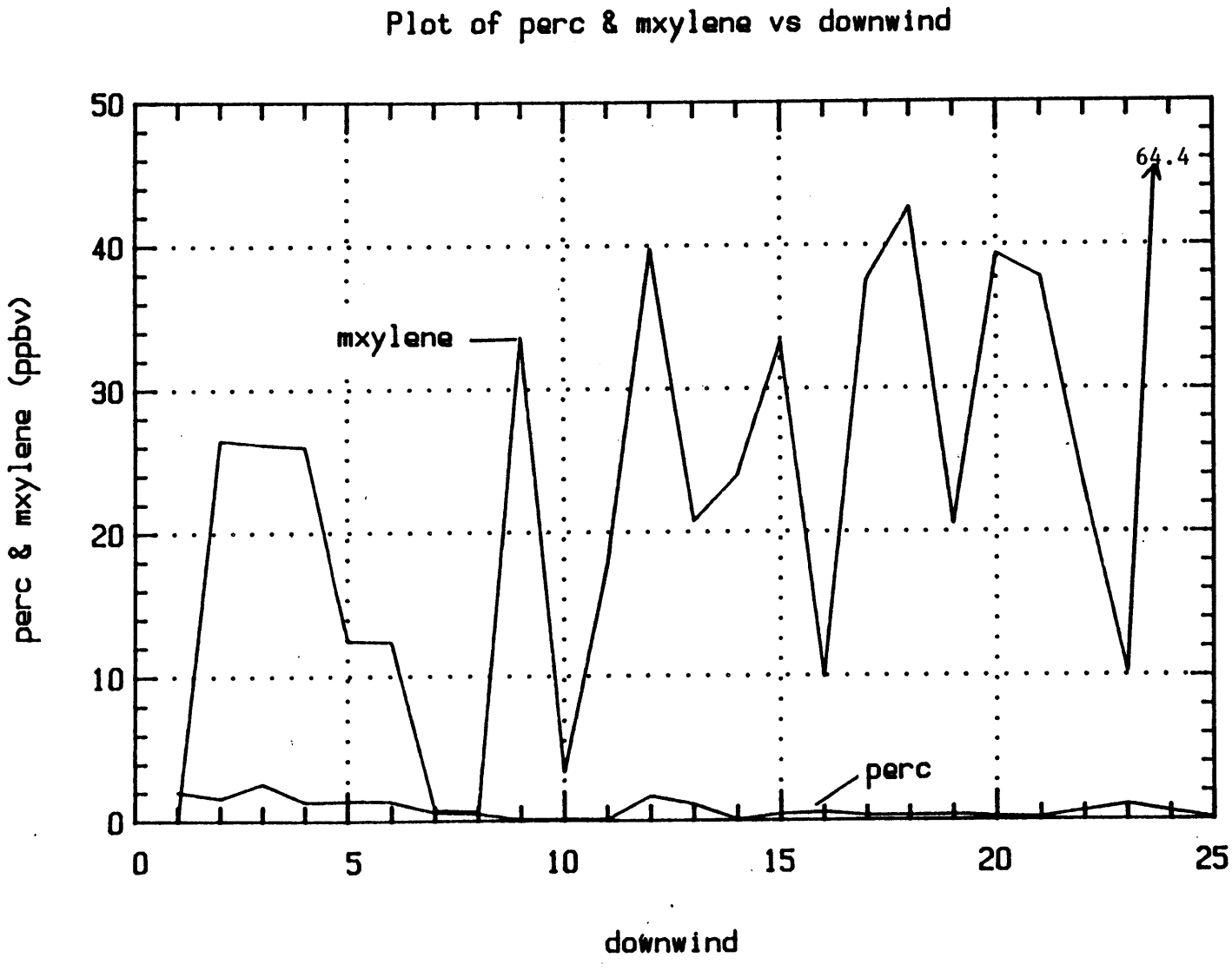


Figure 3

Downwind concentrations trends for m-xylene and perchloethylene.



Appendix C

Letter of Participation in Study

July 7, 1986

We are writing to selected parents of students at Our Lady of Mercy School to invite their participation in a special health survey. The purpose if this survey is to determine whether the emissions from the Van Leer Container Company, located across from the school, might be affecting the health of area residents and Our Lady of Mercy students.

Area residents and school officials have been expressing concern about these emissions for several years. In response to the concern of the community, the Hudson County Regional Health Commission requested the New Jersey Department of Health to help them address the health issues.

School officials and parents felt that Our Lady of Mercy students were having a high number of nosebleeds. We determined that the number of nosebleeds at Our Lady of Mercy was similar to that in three other schools, but there was one unusual finding. Nosebleeds are usually more common in the winter, but at Our Lady of Mercy they tended to occur more in the warmer months, when the windows are open and the children spend more time outside.

Because these findings did not rule out an effect of outdoor air contaminants on the school children, we would like to further investigate this issue. It is for the next step that we need your help.

We are inviting approximately 50 parents of Our Lady of Mercy students who live in the area most exposed to the plant emissions and 50 parents who live furthest away from the emissions to participate in a health survey.

The survey will include a questionnaire dealing with health symptoms and workplace and home exposures, an examination of the nose and a test of the sense of smell. It will take place at Our Lady of Mercy School from 6 p.m. to 10 p.m. on July 29 and 30 and August 12 and will take about an hour.

We may be calling you within the next two weeks to ask for your participation in the survey. If you agree to participate, we will then schedule an appointment for your examination.

Your participation in this project will provide information important to all Our Lady of Mercy students as well as residents living close to the plant. If this survey does provide strong suggestion of a health effect, further studies may be planned for the students when school begins in the fall.

Thank you. If you have any questions before we contact you, please call Ann Allgood or Julie Petix collect at (609) 984-1863.

Yours truly,

Diana Ordin, M.D.
Chief, Medical Evaluation Program
Division of Occupational and
Environmental Health Services

DO/alb
Enclosure

Appendix D

Symptoms Questionnaire

CONSENT FORM

VAN LEER HEALTH SURVEY

I have been informed that the New Jersey Department of Health is conducting a health survey of selected parents of students from Our Lady of Mercy School. The survey involves a questionnaire dealing with health symptoms and workplace and home exposures, an examination of the nose and a test of the sense of smell. Sprayed local anesthetic will be used for the nose examination. During the nose examination, the doctor will wipe the inside of the nose with a swab and this wiping will later be examined under a microscope.

I understand that these tests deal only with the nose and do not replace a general medical examination.

All individual results and personal information will be kept confidential by the New Jersey Department of Health. I will receive a copy of my individual results as well as a copy of the summary report, in which no names will be used.

This is a voluntary examination. I may withdraw at any time or refuse any test. Each component of the survey will be explained to me before I begin and I will have an opportunity to ask any questions I may have.

I also understand that I should NOT tell the nose examiners or smell testers whether I have any nose problems or where I live in relation to Van Leer Containers. This is important so that the exams can be as objective as possible.

NAME (SIGNATURE) _____

NAME (PRINT) _____

ADDRESS (number and street only)

_____

DATE: _____

ID Number (to be filled out by Dept. of Health) __ __ __

0116

New Jersey State Department of Health
Division of Occupational and Environmental Health

VAN LEER QUESTIONNAIRE

Interviewer's Initials _____ I.D. Code ___/___/___ 1-3

Interview Date: 1. ____ Day 1 3. ____ Day 3 4
2 ____ Day 2 4. ____ Day 4

I. BACKGROUND

1. Name _____ 5-24 Last
Last First MI 24-34 First
35 MI

2. Current Street Address _____ 36-55 Street

53-65 City

City, State, Zip _____ 66-67 State
68-72 Zip

Telephone Number (_____)_____

3. How many years have you lived in this house? _____ years 73-74
(Round to nearest whole number; if <1, write <1.)

4. Sex (by observation): 1. ____ Male 2. ____ Female 75

5. Race (by observation):

1. ____ White 2. ____ Black 3. ____ Other (Spec.)_____ 76

6. How old were you on your last birthday? _____ Years 77-78

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7. What is your date of birth? ___ ___/___ ___/___ ___ 4-9

8. What is the highest level of education that you have completed? 10-11
(Circle one only)

Grade: 1 2 3 4 5 6 7 8 9 10 11 12

College: 13 14 15 16 17+

II. HOME AND WORKPLACE EXPOSURES

9. Are you currently employed? 12

1. ____ Yes 2. ____ No (go to 11)

a. Where do you work?

Name of Company _____

City and State _____

b. What is the primary product or service of this employer? _____

c. What are your main activities in this job?

_____

_____

_____

d. What is your current job title?

_____

10. Do you have a second job? 13

1. ____ Yes 2. ____ No (go to 12)

a. Where do you work?

Name of Company _____

City and State _____

b. What is the primary product or service of this employer? _____

c. What are your main activities in this job?

_____

_____

_____

d. What is your current job title?

_____

11. (If not employed) are you: 14

1. ____ Homemaker 3. ____ Unemployed
2. ____ Student 4. ____ Retired

12. Average number hours away from immediate home neighborhood per day: (If respondent unable to answer, write 99)

a. Mon - Fri _____ 15-16

b. Sat - Sun _____ 17-18

13. Are you exposed to chemicals for more than 1/2 hour per day? (Include work, hobbies, home activities. Do not include environmental air pollution.)

1. ____ Yes 2. ____ No (go to 14) 9. _____ DK 19

a. What chemicals? (If unable to classify, write name of agent in b.)

(1) Metal dusts	1 ____ Yes	2 ____ No	9 ____ DK	20
(2) Acid fumes	1 ____ Yes	2 ____ No	9 ____ DK	21
(3) Industrial solvents	1 ____ Yes	2 ____ No	9 ____ DK	22
(4) Cleaning products	1 ____ Yes	2 ____ No	9 ____ DK	23
(5) Herbicides or pesticides	1 ____ Yes	2 ____ No	9 ____ DK	24
(6) Other (specify)	1 ____ Yes	2 ____ No	9 ____ DK	25

_____

b. Describe circumstances of exposure:

_____

_____

_____

14. What type of heat do you have in your home? 26

1. ____ Forced air
2. ____ Steam or hot water
3. ____ Built-in electric units
4. ____ Other (Specify) _____
9. ____ DK

15. Do you use a fireplace or a wood stove to help heat your home? 27

1. _____ Yes (Specify) _____
2. _____ No 9. _____ DK

16. Do you use a kerosene heater to help heat your home? 28

1. _____ Yes 2. _____ No 9. _____ DK

17. Do you have a humidifier in your home? 29
    1. _____ Yes 2. _____ No 9. _____ DK

18. Do you air condition your home? 30
    1. _____ Yes 2. _____ No 9. _____ DK
    a. Number of room units _____ 31
    b. Central? 1. _____ Yes 2. _____ No 32

19. Do you have an air purifier in your home? 33
    1. _____ Yes 2. _____ No 9. _____ DK

III. SMOKING

20. Have you ever smoked or used tobacco on a regular basis for at least three (3) months? 34
    1. ____ Yes (go to 21)
    2. ____ No (go to 26)
    3. ____ DK (go to 26)

21. How old were you when you started using tobacco regularly? 35-36
    _____ Years Old

22. Do you smoke or use tobacco now? 37
    1. ____ Yes (go to 24) 2. ____ No (go to 23)

23. How old were you when you last quit? 38-39
    _____ Years Old

24. During the last year that you smoked or used tobacco, did you regularly use:

a. Cigarettes	1.____Yes	2.____No	9.____DK	40
b. Cigars	1.____Yes	2.____No	9.____DK	41
c. Pipes	1.____Yes	2.____No	9.____DK	42
d. Chewing tobacco or snuff	1.____Yes	2.____No	9.____DK	43

25. How much did you smoke (or use)?

(if cigarettes)	_____ cigarettes/day	44-45
(if cigars)	_____ number/day	46-47
(if pipes)	_____ pipesful/day	48-49
(if other)	_____ ounces/day	50-51

26. Does anyone (else) smoke tobacco in your home? [52]

1. ____ Yes 2. ____ No

IV. ENT HISTORY AND SYMPTOMS

27. Have you ever had any of the following?

a. A broken nose	1.____Yes	2.____No	9.____DK	[53]
b. Sinus surgery	1.____Yes	2.____No	9.____DK	[54]
c. Sinus infection (sinusitis) treated by a physician	1.____Yes	2.____No	9.____DK	[55]
d. Nasal polyps	1.____Yes	2.____No	9.____DK	[56]
e. Any nasal surgery (describe) _____	1.____Yes	2.____No	9.____DK	[57]
f. Ulcers in nose	1.____Yes	2.____No	9.____DK	[58]

28. Have you ever had asthma? [59]

(1.) ____ Yes 2. ____ No (go to 30) 9. ____ DK (go to 30)

a. Was it confirmed by a doctor? [60]

1. ____ Yes 2. ____ No 9. ____ DK

b. At what age did it start? [61-62]

_____ age in years

c. Do you still have it? [63]

1. ____ Yes (go to 29) 2. ____ No 9. ____ DK (go to 30)

d. At what age did it stop? [64-65]

_____ age stopped (go to 30)

29. a. Is your asthma associated with a particular time of the year? [66]

1. ____ Yes (2.) ____ No (go to c) 9. ____ DK (go to c)

b. If yes, check all that apply:

(1) Spring	1.___Yes	2.___No	9.___DK	67
(2) Summer	1.___Yes	2.___No	9.___DK	68
(3) Fall	1.___Yes	2.___No	9.___DK	69
(4) Winter	1.___Yes	2.___No	9.___DK	70

c. (When you have this problem,) how often does this problem occur? 71

1. ____ Seldom 3. ____ Weekly
2. ____ Monthly 4. ____ Daily

d. Where are you when this problem is most bothersome? 72

1. ____ Home 4. ____ No particular place
2. ____ Work 9. ____ DK
3. ____ Other

e. How many asthma attacks have you had during the past year? 73-74

_____ number of attacks

f. Are you currently taking medications for your asthma? 75

1. _____Yes (specify_____) 2_____No 9_____DK

30. Do you have any allergies affecting your nose? 76

1. ____ Yes 2. ____ No (go to 31) 9. ____ DK (go to 31)

a. Is this associated with a particular time of the year? 77

1. ____ Yes 2. ____ No (go to c) 9. ____ DK (go to c)

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b. If yes, check all that apply:

(1) Spring	1.___Yes	2.___No	9.___DK	4
(2) Summer	1.___Yes	2.___No	9.___DK	5
(3) Fall	1.___Yes	2.___No	9.___DK	6
(4) Winter	1.___Yes	2.___No	9.___DK	7

c. (When you have this problem,) how often does this problem occur? 8

1. ____ Seldom 3. ____ Weekly 5. ____ Other (Specify)
2. ____ Monthly 4. ____ Daily _____

d. Where are you when this problem is most bothersome? 9

1. ____ Home 4. ____ No particular place
2. ____ Work 9. ____ DK
3. ____ Other

e. How old were you when you started to have this problem? 10-11

_____ Years Old

f. Have you been skin tested by a physician? 12

1. ____ Yes (List positive tests or DK)_____
2. ____ No 9. ____ DK

31. Do you have food allergies? 13

1. ____ Yes 2. ____ No 9. ____ DK

32. Do you have allergies to medication? 14

1. ____ Yes (Specify) _____
2. ____ No 9. ____ DK

33. Did you have allergies when you were a child? 15

1. ____ Yes 2. ____ No 9. ____ DK

In the past few years, have you had problems with any of the following?

34. Runny Nose 16

1. ____ Yes 2. ____ No (go to 35) 9. ____ DK (go to 35)

a. Do you have this problem only when you have allergies or colds? 17

1. ____ Yes (go to 35) 2. ____ No 9. ____ DK

b. Is this associated with a particular time of the year? 18

1. ____ Yes 2. ____ No (go to d) 9. ____ DK (go to d)

c. If yes, check all that apply:

(1) Spring	1.____Yes	2.____No	9.____DK	19
(2) Summer	1.____Yes	2.____No	9.____DK	20
(3) Fall	1.____Yes	2.____No	9.____DK	21
(4) Winter	1.____Yes	2.____No	9.____DK	22

d. (When you have this problem,) how often does this problem occur? 23

1. ____ Seldom 3. ____ Weekly
2. ____ Monthly 4. ____ Daily

e. Where are you when this problem is most bothersome? 24

1. ____ Home 4. ____ No particular place
2. ____ Work 9. ____ DK
3. ____ Other

f. How old were you when you started to have this problem? 25-26

_____ Years Old

35. Itchy Nose

1. ____ Yes 2. ____ No (go to 36) 9. ____ DK (go to 36) 27

a. Do you have this problem only when you have allergies or colds?

1. ____ Yes (go to 36) 2. ____ No 9. ____ DK 28

b. Is this associated with a particular time of the year?

1. ____ Yes 2. ____ No (go to d) 9. ____ DK (go to d) 29

c. If yes, check all that apply:

(1) Spring	1.____Yes	2.____No	9.____DK	30
(2) Summer	1.____Yes	2.____No	9.____DK	31
(3) Fall	1.____Yes	2.____No	9.____DK	32
(4) Winter	1.____Yes	2.____No	9.____DK	33

d. (When you have this problem,) how often does this problem occur? 34

1. ____ Seldom 3. ____ Weekly
2. ____ Monthly 4. ____ Daily

e. Where are you when this problem is most bothersome? 35

1. ____ Home 4. ____ No particular place
2. ____ Work 9. ____ DK
3. ____ Other

f. How old were you when you started to have this problem? 36-37

_____ Years Old

36. Sneezing

1. ____ Yes 2. ____ No (go to 37) 9. ____ DK (go to 37) 38

a. Do you have this problem only when you have allergies or colds?

1. ____ Yes (go to 37) 2. ____ No 9. ____ DK 39

b. Is this associated with a particular time of the year? 40
1. ____ Yes (2.) ____ No (go to d) 9. ____ DK (go to d)

c. If yes, check all that apply:

(1) Spring	1.____Yes	2.____No	9.____DK
(2) Summer	1.____Yes	2.____No	9.____DK
(3) Fall	1.____Yes	2.____No	9.____DK
(4) Winter	1.____Yes	2.____No	9.____DK

41 42 43 44

d. (When you have this problem,) how often does this problem occur? 45
1. ____ Seldom (3.) ____ Weekly
2. ____ Monthly (4.) ____ Daily

e. Where are you when this problem is most bothersome? 46
(1.) ____ Home 4. ____ No particular place
2. ____ Work 9. ____ DK
3. ____ Other

f. How old were you when you started to have this problem? 47-48
_____ Years Old

37. Dry Nose (other than with allergy medications or cold medications)
(1.) ____ Yes 2. ____ No (go to 38) 9. ____ DK (go to 38) 49

a. Is this associated with a particular time of the year? 50
1. ____ Yes (2.) ____ No (go to c) 9. ____ DK (go to d)

b. If yes, check all that apply:

(1) Spring	1.____Yes	2.____No	9.____DK
(2) Summer	1.____Yes	2.____No	9.____DK
(3) Fall	1.____Yes	2.____No	9.____DK
(4) Winter	1.____Yes	2.____No	9.____DK

51 52 53 54

c. (When you have this problem,) how often does this problem occur? 55
1. ____ Seldom (3.) ____ Weekly
2. ____ Monthly (4.) ____ Daily

d. Where are you when this problem is most bothersome? 56
1. ____ Home 4. ____ No particular place
2. ____ Work 9. ____ DK
3. ____ Other

e. How old were you when you started to have this problem? 57-58
_____ Years Old

38. Crusting of Nose
1. ____ Yes 2. ____ No (go to 39) 9. ____ DK (go to 39) 59

a. Is this associated with a particular time of the year? 60
1. ____ Yes 2. ____ No (go to c) 9. ____ DK (go to c)

b. If yes, check all that apply:

(1) Spring 1.____Yes 2.____No 9.____DK 61
(2) Summer 1.____Yes 2.____No 9.____DK 62
(3) Fall 1.____Yes 2.____No 9.____DK 63
(4) Winter 1.____Yes 2.____No 9.____DK 64

c. (When you have this problem,) how often does this problem occur? 65
1. ____ Seldom 3. ____ Weekly
2. ____ Monthly 4. ____ Daily

d. Where are you when this problem is most bothersome? 66
1. ____ Home 4. ____ No particular place
2. ____ Work 9. ____ DK
3. ____ Other

e. How old were you when you started to have this problem? 67-68
_____ Years Old

39. Pain In Nose
1. ____ Yes 2. ____ No (go to 40) 9. ____ DK (go to 40) 69

a. Is this associated with a particular time of the year? 70
1. ____ Yes 2. ____ No (go to c) 9. ____ DK (go to c)

b. If yes, check all that apply:

(1) Spring	1.___Yes	2.___No	9.___DK	71
(2) Summer	1.___Yes	2.___No	9.___DK	72
(3) Fall	1.___Yes	2.___No	9.___DK	73
(4) Winter	1.___Yes	2.___No	9.___DK	74

c. (When you have this problem,) how often does this problem occur?

1. ____ Seldom 3. ____ Weekly
2. ____ Monthly 4. ____ Daily

75

d. Where are you when this problem is most bothersome?

1. ____ Home 4. ____ No particular place
2. ____ Work 9. ____ DK
3. ____ Other

76

e. How old were you when you started to have this problem?

_____ Years Old

77-78

f. Does this problem occur on the right side, left side,or both?

1. ____ Right 2. ____ Left 3. ____ Both

79

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40. Nasal Obstruction (problems breathing through your nose)

1. ____ Yes 2. ____ No (go to 41) 9. ____ DK (go to 41)

4

a. Does this problem occur on the right side, left side,or both?

1. ____ Right 2. ____ Left 3. ____ Both

5

b. Do you have this problem only when you have allergies or colds?

1. ____ Yes (go to 41) 2. ____ No 9. ____ DK

6

c. Is this associated with a particular time of the year?

1. ____ Yes 2. ____ No (go to e) 9. ____ DK (go to e)

7

d. If yes, check all that apply:

(1) Spring	1.___Yes	2.___No	9.___DK	8
(2) Summer	1.___Yes	2.___No	9.___DK	9
(3) Fall	1.___Yes	2.___No	9.___DK	10
(4) Winter	1.___Yes	2.___No	9.___DK	11

e. (When you have this problem,) how often does this problem occur?

1. ____ Seldom 3. ____ Weekly
2. ____ Monthly 4. ____ Daily

12

f. Where are you when this problem is most bothersome?

1. ____ Home 4. ____ No particular place
2. ____ Work 9. ____ DK
3. ____ Other

13

g. How old were you when you started to have this problem?

_____ Years Old

14-15

41. Sinus Pain (pain over cheeks, between eyes, or center of forehead

1. ____ Yes 2. ____ No (go to 42) 9. ____ DK (go to 42)

16

a. Does this problem occur on the right side, left side,or both?

1. ____ Right 2. ____ Left 3. ____ Both

17

b. Do you have this problem only when you have allergies or colds?

1. ____ Yes (go to 42) 2. ____ No 9. ____ DK

18

c. Is this associated with a particular time of the year?

1. ____ Yes 2. ____ No (go to e) 9. ____ DK (go to e)

19

d. If yes, check all that apply:

(1) Spring	1.___Yes	2.___No	9.___DK	20
(2) Summer	1.___Yes	2.___No	9.___DK	21
(3) Fall	1.___Yes	2.___No	9.___DK	22
(4) Winter	1.___Yes	2.___No	9.___DK	23

e. (When you have this problem,) how often does this problem occur?

1. ____ Seldom 3. ____ Weekly
2. ____ Monthly 4. ____ Daily

24

f. Where are you when this problem is most bothersome? 25
1. ____ Home 4. ____ No particular place
2. ____ Work 9. ____ DK
3. ____ Other

g. How old were you when you started to have this problem? 26-27
_____ Years Old

42. Itching or Burning Eyes
1. ____ Yes 2. ____ No (go to 43) 9. ____ DK (go to 43) 28

a. Do you have this problem only when you have allergies or colds? 29
1. ____ Yes (go to 43) 2. ____ No 9. ____ DK

b. Is this associated with a particular time of the year? 30
1. ____ Yes 2. ____ No (go to d) 9. ____ DK (go to d)

c. If yes, check all that apply:

(1) Spring	1.____Yes	2.____No	9.____DK	31
(2) Summer	1.____Yes	2.____No	9.____DK	32
(3) Fall	1.____Yes	2.____No	9.____DK	33
(4) Winter	1.____Yes	2.____No	9.____DK	34

d. (When you have this problem,) how often does this problem occur? 35
1. ____ Seldom 3. ____ Weekly
2. ____ Monthly 4. ____ Daily

e. Where are you when this problem is most bothersome? 36
1. ____ Home 4. ____ No particular place
2. ____ Work 9. ____ DK
3. ____ Other

f. How old were you when you started to have this problem? 37-38
_____ Years Old

43. Watery Eyes
1. ____ Yes 2. ____ No (go to 44) 9. ____ DK (go to 44) 39

a. Do you have this problem only when you have allergies or colds? 40
1. ____ Yes (go to 44) 2. ____ No 9. ____ DK

b. Is this associated with a particular time of the year? 41
1. ____ Yes 2. ____ No (go to d) 9. ____ DK (go to d)

c. If yes, check all that apply:

(1) Spring	1.___Yes	2.___No	9.___DK	42
(2) Summer	1.___Yes	2.___No	9.___DK	43
(3) Fall	1.___Yes	2.___No	9.___DK	44
(4) Winter	1.___Yes	2.___No	9.___DK	45

d. (When you have this problem,) how often does this problem occur?

1. ____ Seldom 3. ____ Weekly
2. ____ Monthly 4. ____ Daily

46

e. Where are you when this problem is most bothersome?

1. ____ Home 4. ____ No particular place
2. ____ Work 9. ____ DK
3. ____ Other

47

f. How old were you when you started to have this problem?

_____ Years Old

48-49

44. Nosebleeds

1. ____ Yes 2. ____ No (go to 45) 9. ____ DK (go to 45)

50

a. Is this associated with a particular time of the year?

1. ____ Yes 2. ____ No (go to c) 9. ____ DK (go to c)

51

b. If yes, check all that apply:

(1) Spring	1.___Yes	2.___No	9.___DK	52
(2) Summer	1.___Yes	2.___No	9.___DK	53
(3) Fall	1.___Yes	2.___No	9.___DK	54
(4) Winter	1.___Yes	2.___No	9.___DK	55

c. (When you have this problem,) how often does this problem occur?

1. ____ Seldom 3. ____ Weekly
2. ____ Monthly 4. ____ Daily

56

d. Where are you when this problem is most bothersome?

1. ____ Home 4. ____ No particular place
2. ____ Work 9. ____ DK
3. ____ Other

57

e. How old were you when you started to have this problem?
_____ Years Old 58-59

f. Does this problem occur on the right side, left side, or both?
1. ____ Right 2. ____ Left 3. ____ Both 60

g. Are they related to colds?
1. _____ Yes (2.) _____ No 9. _____ DK 61

h. Are they related to allergies?
1. ____ Yes (2.) ____ No 9. ____ DK 62

i. Women Only: Are they related to getting your period?
1. ____ Yes (2.) ____ No 9. ____ DK 0. ____ N/A 63

45. Headaches (Do NOT include sinus pain)
1. ____ Yes 2. ____ No (got to 46) 9. ____ DK (go to 46) 64

a. Is this associated with a particular time of the year?
1. ____ Yes (2.) ____ No (go to c) 9. ____ DK (go to c) 65

b. If yes, check all that apply:

(1) Spring	1.____Yes	2.____No	9.____DK	66
(2) Summer	1.____Yes	2.____No	9.____DK	67
(3) Fall	1.____Yes	2.____No	9.____DK	68
(4) Winter	1.____Yes	2.____No	9.____DK	69

c. (When you have this problem,) how often does this problem occur?
1. ____ Seldom 3. ____ Weekly
2. ____ Monthly 4. ____ Daily 70

d. Where are you when this problem is most bothersome?
1. ____ Home 4. ____ No particular place
2. ____ Work 9. ____ DK
3. ____ Other 71

e. How old were you when you started to have this problem?
_____ Years Old 72-73

f. What do you think causes this problem?

_____

_____

46. Sore or Scratchy Throat

1. ____ Yes 2. ____ No (go to 47) 9. ____ DK (go to 47) | 74

a. Is this associated with a particular time of the year?

1. ____ Yes 2. ____ No (go to c) 9. ____ DK (go to c) | 75

4 End Card | 80

ID Code | 1-3

b. If yes, check all that apply:

(1) Spring	1.____Yes 2.____No 9.____DK	4
(2) Summer	1.____Yes 2.____No 9.____DK	5
(3) Fall	1.____Yes 2.____No 9.____DK	6
(4) Winter	1.____Yes 2.____No 9.____DK	7

c. (When you have this problem,) how often does this problem occur? | 8

1. ____ Seldom 3. ____ Weekly
2. ____ Monthly 4. ____ Daily

d. Where are you when this problem is most bothersome? | 9

1. ____ Home 4. ____ No particular place
2. ____ Work 9. ____ DK
3. ____ Other

e. How old were you when you started to have this problem?

_____ Years Old | 10-11

47. Dry Throat

1. ____ Yes 2. ____ No (go to 48) 9. ____ DK (go to 48) | 12

a. Is this associated with a particular time of the year?

1. ____ Yes 2. ____ No (go to c) 9. ____ DK (go to c) | 13

b. If yes, check all that apply:

(1) Spring	1.____Yes 2.____No 9.____DK	14
(2) Summer	1.____Yes 2.____No 9.____DK	15
(3) Fall	1.____Yes 2.____No 9.____DK	16
(4) Winter	1.____Yes 2.____No 9.____DK	17

c. (When you have this problem,) how often does this problem occur? 18

1. ___ Seldom 3. ___ Weekly
2. ___ Monthly 4. ___ Daily

d. Where are you when this problem is most bothersome? 19

1. ___ Home 4. ___ No particular place
2. ___ Work 9. ___ DK
3. ___ Other

e. How old were you when you started to have this problem? 20-21

_____ Years Old

48. Nausea

1. ___ Yes 2. ___ No (go to 49) 9. ___ DK (go to 49) 22

a. Is this associated with a particular time of the year?

1. ___ Yes 2. ___ No (go to c) 9. ___ DK (go to c) 23

b. If yes, check all that apply:

(1) Spring	1.___Yes	2.___No	9.___DK	24
(2) Summer	1.___Yes	2.___No	9.___DK	25
(3) Fall	1.___Yes	2.___No	9.___DK	26
(4) Winter	1.___Yes	2.___No	9.___DK	27

c. (When you have this problem,) how often does this problem occur? 28

1. ___ Seldom 3. ___ Weekly
2. ___ Monthly 4. ___ Daily

d. Where are you when this problem is most bothersome? 29

1. ___ Home 4. ___ No particular place
2. ___ Work 9. ___ DK
3. ___ Other

e. How old were you when you started to have this problem? 30-31

_____ Years Old

f. What do you think causes this problem?

_____

_____

49. Frequent Cough

1. ____ Yes 2. ____ No (go to 50) 9. ____ DK (go to 50) 32

a. Is this associated with a particular time of the year?

1. ____ Yes 2. ____ No (go to c) 9. ____ DK (go to c) 33

b. If yes, check all that apply:

(1) Spring	1.____Yes	2.____No	9.____DK	34
(2) Summer	1.____Yes	2.____No	9.____DK	35
(3) Fall	1.____Yes	2.____No	9.____DK	36
(4) Winter	1.____Yes	2.____No	9.____DK	37

c. (When you have this problem,) how often does this problem occur?

1. ____ Seldom 3. ____ Weekly 38
2. ____ Monthly 4. ____ Daily

d. Where are you when this problem is most bothersome?

1. ____ Home 4. ____ No particular place 39
2. ____ Work 9. ____ DK
3. ____ Other

e. How old were you when you started to have this problem?

_____ Years Old 40-41

50. Have you ever had gum or other dental diseases?

1. _____ Yes 2. _____ No 9. _____ DK 42

51. Have you ever had dental surgery? (Tooth extractions, jaw repair, etc.)

1. _____ Yes 2. _____ No 9. _____ DK 43

52. Have you ever had any head or facial injury? (Such as loss of consciousness or trauma from a car or sport accident)

1. _____ Yes 2. _____ No 9. _____ DK 44

53. Have you had any nasal, dental or head surgery that has not yet been mentioned?

1. _____ Yes 2. _____ No 9. _____ DK 45

54. Have you ever had any of the following conditions: (Check all that apply)

				Age At Onset	
a. High blood pressure	1.___Yes	2.___No	9.___DK	_____	46
b. Diabetes	1.___Yes	2.___No	9.___DK	_____	47
c. Epileptic seizures	1.___Yes	2.___No	9.___DK	_____	48
d. Kidney disease (other than infections-specify) _____ _____	1.___Yes	2.___No	9.___DK	_____	49
e. Bleeding problems (problems stopping bleeding during surgery or injury, spontaneous bleeding (Specify) _____ _____ _____	1.___Yes	2.___No	9.___DK	_____	50

55. Have you had more than 6 colds in the past year? 51
1. ____ Yes 2. ____ No 9. ____ DK

V. CHEMOSENSORY

56. Would you characterize your sense of smell now as: 52
1. ____ Normal (go to 57)
2. ____ Decreased but not absent
3. ____ Completely absent
9. ____ DK (go to 57)

a. How old were you when this loss began?
_____ Years Old 53-54

b. Does your sense of smell ever return under special conditions? (Such as, exercise or medication) 55
1. ____ Yes (Specify) _____
2. ____ No 9. ____ DK

c. Does this loss affect your appetite?
1. _____ Yes 2. _____ No 9. _____ DK 56

d. What do you feel caused this loss? 57

1. ____ Disease (Specify) _____
2. ____ Accident (Specify) _____
3. ____ Exposure (Specify) _____
4. ____ Surgery (Specify) _____
5. ____ Other (Specify) _____
9. ____ Don't Know

57. Would you characterize your sense of taste now as : 58

1. ____ Normal (go to 58)
2. ____ Decreased but not absent
3. ____ Completely absent
4. ____ Better than it has been
9. ____ DK (go to 58)

a. How old were you when the loss began? 59-60
_____ Years Old

b. What do you feel caused this loss? 61

1. ____ Disease (Specify) _____
2. ____ Accident (Specify) _____
3. ____ Exposure (Specify) _____
4. ____ Surgery (Specify) _____
5. ____ Other (Specify) _____
9. ____ Don't Know

VI. CURRENT SYMPTOMS

58. Do you now have a cold? 62

1. _____ Yes 2. _____ No 9. _____ DK

59. Are you having any nose problems tonight? 63

1. _____ Yes (Describe) _____
_____
_____

2. _____ No 9. ____ DK

60. Please tell me all medications, including prescription and non-prescription drugs, that you have used in the past week?

_____

_____

_____

_____

61. Which of these medications have you taken today? (circle positives in 60)

62. How many children do you have?

_____ Number of children

64-65

63. Do any of your children have asthma?

1. ____ Yes 2. ____ No (go to 64) 9. ____ DK (go to 64)

66

a. Number of children with asthma:

_____ Number of children

67-68

b. Please tell me the ages of your children who have asthma

_____

64. If you smoke, how long ago did you smoke your last cigarette?

69

1. ____ Less than 1 Hour
2. ____ 1 - 2 Hours
3. ____ More than 2 Hours

FOR WOMEN ONLY

65. Do you currently have your period?

1. _____ Yes 2. _____ No 9. _____ DK

70

66. Are you currently pregnant?

1. _____ Yes 2. _____ No 9. _____ DK

71

5 End
80 Card

Appendix E

Odor Test Questionnaire

First Name, Last Initial _____ ID Number ___ ___ ___

DATA SHEET

Key: check mark = correct
NS = No Sensation (doesn't smell anything)
DK = Don't Know (can smell it, but cannot identify it)
misidentification

ODORANTS	TRIAL 1		TRIAL 2		CORRECT	
	LN	RN	LN	RN	LN	RN
1. BABY POWDER						
2. CHOCOLATE						
3. CINNAMON						
4. COFFEE						
5. MOTHBALLS						
6. PEANUT BUTTER						
7. SOAP						
			TOTAL CORRECT			
TRIGEMINAL ITEM						
8. VICKS						

Examiner's Signature _____

ODORANT	BRAND
Baby Powder	Johnson's
Chocolate	Baker's Semi-sweet (no vanilla)
Cinnamon	Durkee
Coffee	Hills Bros.
Mothballs	Whatever
Peanut Butter	Jiff
Soap	Ivory bar soap
Vicks	Vicks VapoSteam (liquid form)

INSTRUCTIONS

Create a sachet of each item by putting 1 to 2 Tbs of each into a square of gauze and tying it up. Use chips of Ivory bar soap and pour the Vicks VapoSteam onto several cotton balls. Put each sachet into an opaque jar with a screw top. Label the top of each jar with the item number.

TEST OF ODOR IDENTIFICATION

INSTRUCTIONS TO SUBJECT

This is a test of your ability to sniff and identify various familiar odors. I will hold one of these jars [hold up jar for subject to see] under your nose. I will ask you to close your eyes and sniff. You may sniff as often as you like before you tell me what you think is in the jar. [Hand subject the list of odor names.] Everything I give you is on this list, but I won't be giving you everything that is on the list. If you smell something in the jar, but can't quite think what it is, read down the list slowly and it will help you. If you smell something, but it is too faint for you to make a guess, tell me that. If you smell nothing at all, tell me that too. Each trial will be for one nostril. I will ask you to pinch off the side that is not getting the smell. Please keep pinching until you make your guess. We will alternate nostrils from trial to trial. Any questions?

INSTRUCTIONS FOR TESTER

Present all 8 odorants to each nostril. Present stimuli in any order. Do not present same stimulus twice in a row. Do not present stimuli to the same nostril twice in a row. Remind subject to close eyes and pinch off one nostril before presenting stimulus. Prompt subject with the word "sniff" when the jar is under the nostril to be tested. Remind subject to keep pinching non-tested nostril until the guess is made. The subject may sniff as often as he or she likes. Remind subject to refer to the list of odor names. Give corrective feedback after each trial, i.e., tell the subject what the odorant actually was.

Once all 8 odorants have been presented once through to each nostril, repeat items for which the original answer was incorrect. Remember, for each nostril, the subject has two chances to make a correct response.

NOTE: ALWAYS TAKE THE LIDS OFF WITH YOUR LEFT HAND COVERING THE NUMBER

TEST SCORING

The test is scored separately for each nostril. The test score is based only on the responses to the seven non-trigeminal odorants (i.e., baby powder, chocolate, cinnamon, coffee, mothballs, peanut butter, and soap). The subject receives credit for a correct response if the answer on trial 1 or trial 2 was correct. A "nose" score may be calculated by averaging the scores for the left and right nostrils.

SCORE	DIAGNOSIS
6.0 - 7.0	Normosmia
5.0 - 5.9	Mild Hyposmia
4.0 - 4.9	Moderate Hyposmia
2.0 - 3.9	Severe Hyposmia
0 - 1.9	Anosmia

DATA SHEET

Key: check mark = correct
NS = No Sensation
DK = Don't Know
specify misidentification

ODORANTS	TRIAL 1		TRIAL 2		CORRECT	
	LN	RN	LN	RN	LN	RN
1. BABY POWDER						
2. CHOCOLATE						
3. CINNAMON						
4. COFFEE						
5. MOTHBALLS						
6. PEANUT BUTTER						
7. SOAP						
					TOTAL CORRECT	

TRIGEMINAL ITEM

8. VICKS

TEST ITEMS

9.
10.

ODOR NAMES

BABY POWDER

BURNT PAPER

CHOCOLATE

CINNAMON

COFFEE

GARLIC

GRAPE JAM

KETCHUP

LEMON

MOTHBALLS

ONION

PEANUT BUTTER

BLACK PEPPER

RUBBER

SPEARMINT

IVORY SOAP

TOBACCO

TURPENTINE

VICKS

WOOD SHAVINGS

Appendix F

Nasal Speculum Examination Form

ENT - SPECULUM EXAM

First name, last initial _____ id code _____
(PRINT)

Examiner's initials _____

EXTERNAL EXAMINATION

Nasal tenderness:	Rt.	Lt.	Both	Neither
Sinus tenderness:	R	L	B	N
Evidence of bleeding:	R	L	B	N
Evidence of discharge:	R	L	B	N
Significant external abnormality:	Yes	No		

Describe: _____

_____

Deviation: saddling other _____

INTERNAL EXAM

MUCOSA:	RIGHT	LEFT
1.	normal	normal
2.	pale	pale
3.	edematous	edematous
4.	erythema	erythema
5.	dry	dry
6.	crusted	crusted
7.	erosion	erosion
8.	active bleeding	active bleeding
9.	prominent vessel	prominent vessel
10.	other (describe)	other (describe)

_____

_____

_____

First name, last initial _____ id code_____
PRINT

examiner's initials _____

SEPTUM: midline deviated R deviated L perforation

TURBINATES:	RIGHT	LEFT
1.	normal	normal
2.	pale	pale
3.	bluish	bluish
4.	edematous	edematous
5.	granular	granular
6.	polypoid	polypoid
7.	eroded	eroded
8.	hypertrophied	hypertrophied

SECRETIONS:	RIGHT	LEFT
1.	none	none
2.	scant	scant
3.	profuse	profuse
4.	watery	watery
5.	mucoid	mucoid
6.	purulent	purulent

Appendix G

Nasal Fiberoptic Examination Form

FIBEROPTIC ENT EXAMINATION

First name, last initial _____ id code_____

examiner's initials _____

side examined: Right Left

SINUS ORIFICES: 1. clear 2. mucoid discharge 3. pus

NASAL CAVITY: 1. Patent 2. Obstructed

a. mucous

b. blood

c. crust

d. other
(_____)

NASOPHARYNX: 1. normal

2. erythema

3. pale

4. polypoid

5. edema

6. crusted

7. other
(_____)

EUSTACHIAN TUBE ORIFICES: 1. clear 2. obstructed
(describe_____
_____
_____

NASOPHARYNGEAL VAULT:

adenoids: 0 (none) 1 (minimal) 2 (more) 3 (obstructed)

other findings (describe) _____
_____

POSTNASAL SPACE: 1. clear 2. mucous (range 1-3)_____

Appendix H

Nasal Cytology Examination Form

First name, last initial _____ ID Code _____

CYTOLOGY RESULTS
(based on examination of 10 hpf)

	0	1	2	3	4
eosinophils					
neutrophils					
basophils/mast cells					
mononuclear cells					
columnar: ciliated					
columnar: non-ciliated					
columnar: CCP					
columnar: metaplastic					
goblet					
squamous: mature					
squamous: anucleate					
squamous: atypical					
bacteria					

_____ cannot be evaluated (specify reason:_____)

COMMENTS:

0=none, 1=occasional to few cells, 2=moderate number, 3=many easily seen, 4=large numbers, may cover entire field