Appendices II.D.1-2

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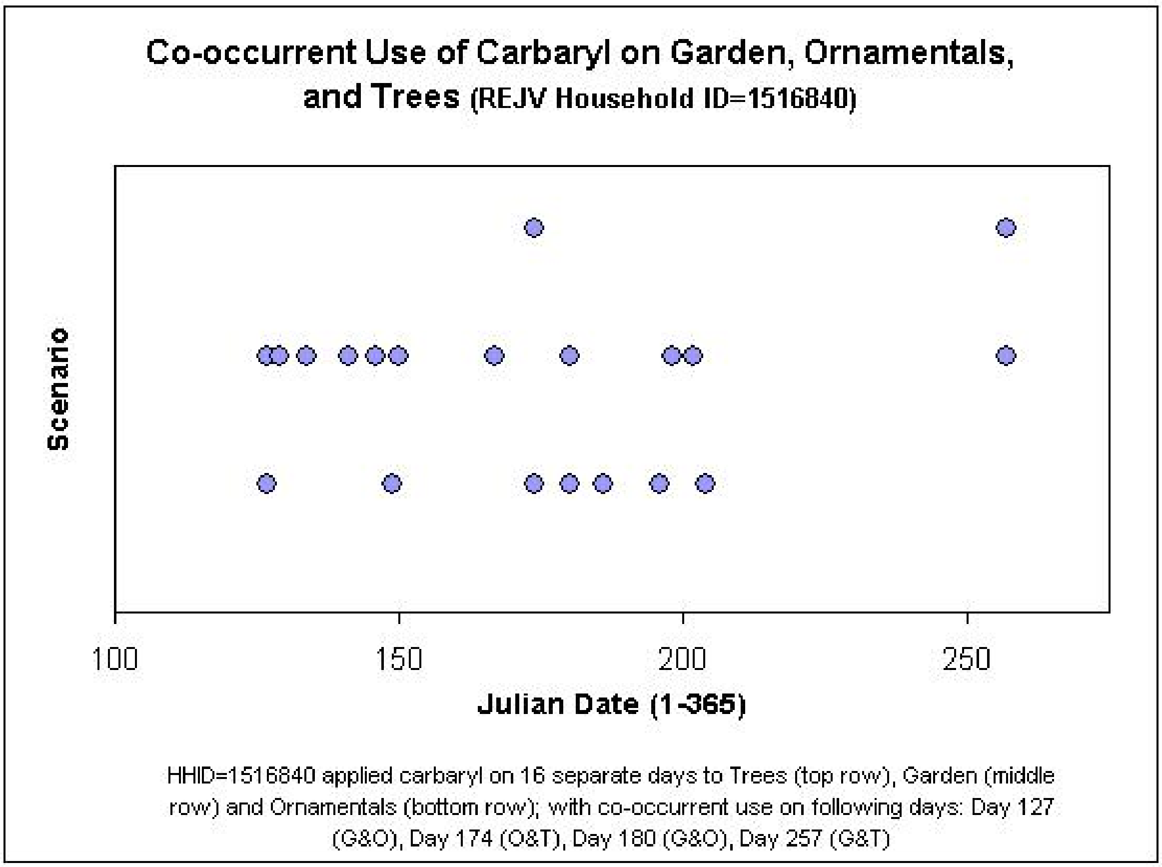
Residential Appendix D-1

1. Residential Pesticide Use Inputs from REJV Survey Data

Pesticide Use and Aggregating Residential Exposures

The probabilistic models require residential pesticide use inputs to aggregate exposure from multiple use scenarios. The percent of households applying the various products, and the timing of those applications directly impact US per capita estimates of aggregate exposure.[1] The REJV data can be used to generate empirically-based estimates to address those needs.

Figure II.D.1-1: Co-occurrent Use for Household-User



[1] The pesticide use data enables the models to account for users (any NMC scenario) and non-users. The models differ in how pesticide use data are utilized to account for users and to account for co-occurrent use (multiple NMC scenarios) among users. The duration (time spent) in treated areas also directly impacts estimates of per capita exposure. Lifeline differs from Calendex and CARES since the NHAPS time use diaries are empirically built into the model; therefore, individuals have a probability of not spending any time in treated areas on any given day; in contrast to the time spent distributions used in Calendex and CARES that reflect only 'doers'.

Figure II.D.1-1 depicts the application scenarios (sites and dates) for a particular REJV Household (1516840). The top row represents carbaryl use on Trees ('Fruit/Nut trees'), the middle row represents carbaryl use on Gardens ('Vegetable Gardens'), and the bottom row represents carbaryl use on Ornamentals ('Ornamental flowers', 'Shrubs/Bushes'). The horizontal axis reflects the Julian dates (Day 1=Jan 1st, Day 365=Dec 31st), and each dot indicates that a carbaryl product was applied to that site on that day. The REJV application records indicate that Household 1516840 applied 5 different carbaryl products to these three sites on 15 different dates: Day 127, 129, 134, 141, 146, 150, 167, 174, 180, 186, 196, 198, 202, 204, and 257.

This household made co-occurrent applications (treated multiple sites) on four dates: (1) Day 127, a 61 yr old female applied carbaryl (Sevin 5% Dust, codewlabel=008) to both her Garden and to Ornamentals (flowers), on (2) Day 180 she applied another carbaryl product (Garden Tech Sevin 10%, codewlabel=016) to her Garden and Ornamentals (shrubs/bushes), on (3) Day 257 she applied a third product ('GARDEN SEVEN-10 BUG KILLER', codewlabel=033) to Garden and Trees, and (4) on Day 174, another household member (72 yr old male) applied carbaryl (Garden Tech Sevin 10%, codewlabel=016) to Ornamentals (shrubs/bushes) and Trees. This anecdotal example suggests that household-users often apply carbaryl to multiple sites on the same day. However, the data also indicate that other homeowners may also treat multiple sites, but on different dates (e.g., HHID=0709697 made five applications of SEVIN DUST 10% to their lawn, and two applications to their Garden on separate dates), while many other users make only one application carbaryl to only one site (e.g., HHID=1607484 made one application of Sevin to their lawn).

The timing of each application event directly affects the modeled surface and air residues available for post-application exposure. In the example above, the household member that applied carbaryl to ornamentals and trees on Day 174, may also receive post-application exposure while tending to the garden that day - to the extent that residues are still available from the previous application, a week earlier (Day 167).

The REJV data was collected to provide refined estimates of both the percent of households affected by various permutations of use scenarios, and the timing of the corresponding application events. Ideally, it would be desirable to empirically utilize the REJV diaries in the exposure models to fully capture the variability in residential use patterns reported among these households. Since the probabilistic risk assessment models currently are unable to utilize the REJV data in that manner, descriptive statistics were extracted - tailored to the specific models – and utilized for this risk assessment.[2] The residential use patterns differ across the models to the extent that these models imperfectly mimic the residential use patterns depicted in the REJV diaries. The next section provides a brief overview of the REJV data. The following sections describe the pesticide use inputs compiled from the REJV data and used in the respective models.

[2] The REJV companies have been working to match the CARES Reference Population with the REJV households. The Calendex developer (S. Peterson) has also been working to incorporate REJV type data into his model. Lifeline already has pesticide use diaries (II.G.e., NHGPUS), built into the model; several modifications would be required to empirically incorporate REJV data.

2. Residential Exposure Joint Venture (REJV) Data[3]

The Residential Exposure Joint Venture (REJV) enlisted households to collect pesticide use data over a 12 month period. An initial screening survey was sent to over 100,000 panel members maintained by the market research firm, National Family Opinion (NFO) Research. The NFO previously collected demographic data for these panel members (e.g., age, gender) as well as information on other household members, the location and type of home, pet (dog/cat/other) ownership, etc. Of the 70,427 individuals that returned the screening survey, about 47,274 (67%) reported applying pesticides during the past year. A subset of respondents (users) whom indicated an interest in participating in the pesticide use survey were recruited to maintain pesticide use diaries. Approximately 6,102 households provided one or more monthly pesticide use diaries, and a total of 1,217 households provided diaries for the entire 12 month study period, May 2001 – April 2002.

At the beginning of the 12 month survey period, these participants were asked to locate all pesticide products stored around their homes - both indoors (kitchen, bathroom) and outdoors (garage, shed), and to record the product's name and EPA Registration number. The respondents were provided numerically labeled stickers, and were asked to affix one sticker to each product so that each product had a unique identification number (e.g., two cans of Raid might be identified as products #1 and #2, respectively). A monthly inventory sheet also was provided so that respondents could update their pesticide product inventory with any new purchases.[4] The REJV consultants (Infoscientific) used the EPA Registration Number to identify all active ingredients contained in the product, and the corresponding percentages from the EPA Pesticide Product Inventory System (PPIS) data base. This information was appended to the appropriate records in the REJV Inventory and Application Tables.

At the end of each of month, the respondents were asked to fill out and send a monthly pesticide product application diary to NFO.[5] The application records contain the following information:

- Application Date
- Name of Pesticide Product
- Pesticide ID
- Where/On Whom The Product Was Applied (Site)
- Who Applied The Pesticide Product
- Method of Application
- If the Product was Used Up

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[3] The REJV consist of approximately 8 member companies who sponsored, and oversaw the residential pesticide use study.

[4] On three occasions, the initial inventory (5/1/01), after six months (11/1/01) and at end of the study period (4/30/02), the respondents were also asked to provide an estimate of how full each of the products were: (1) Have Not Used Yet, (2) 76%-99%, (3) 51%-75%, (4) 26%-50%, (5) 1%-25%. This information can be used to get a rough estimate on the average amount of product applied over all of the applications made during the preceding interval.

[5] The respondents were also asked to fill out and send a pesticide product purchase sheet to record any new products purchased that month.

- ❑ If the Product was Disposed of After Use

The Application Table contains approximately 30,000 valid application records. A valid application is defined as an application that was made by a homeowner with a pesticide product that was in the product inventory table (linked by the unique product identification number from the sticker). This application table provides the primary source of use data for the exposure models.

3. Assigning REJV Application Events to NMC Scenarios

The first task for using REJV data to model pesticide exposure is to assign each relevant application record (event) to a corresponding NMC Scenario. The data from the following three fields in the application table were used to make these assignments: (i) chemical, (ii) application site, and (iii) application method. For this NMC CRA, only application records with products containing NMC chemicals used by homeowners were used. The list of REJV sites is more detailed than the list NMC modeled scenarios. For example, there were 695 application events with a product containing carbaryl to ‘Ornamentals’, of which, 444 application events were to ‘Ornamental Flowers’, 248 events to Shrubs/Bushes, and 3 events to an Aquatic Garden/Pond. While some respondents reported applying carbaryl to two or more of these sites on a given day, such events were considered as one application to ‘Ornamentals’. The decision to group these application sites (Ornamentals) was based on the fact that the REJV did not collect any information on the areas treated nor the application rates, therefore, limiting the ability to utilize such refined estimates.

Table II.D.1-1 Decision Rules for Assigning Application Events to NMC Scenarios in REJV Data

Site Code	APPMETHOD	Lawn		Garden		Ornamentals		Trees		Pet			Other (Carbl & Prop)	Total
		Carbaryl		Carbaryl		Carbaryl		Carbaryl			Carb	Prop		
		Scenario	N	Scenario	N	Scenario	N	Scenario	N	Scenario	N	N	N	N
50	Aerosol spray	HES	3	RTU	9	RTU	21	HES	7	Collar		2	440	1,083
51	Bait box (bait station/traps)			Dust	1	Dust	1						33	115
53	Direct pour (liquid)	HES	1	RTU	1	RTU	2						2	6
54	Foam/Gel												1	1
55	Fogger, outdoor area			HES	2	HES	1							3
58	Granular - broadcast/rotary spreader	GPS	5	Dust	1	Dust	7						2	15
59	Granular - drop spreader	GPS	1	Dust	1	Dust	2							4
60	Granular - handheld rotary spreader			Dust	6	Dust	4	HES	1				1	12
61	Granular/Dust/Powder - pour spout, shaker can	Dust	65	Dust	395	Dust	378	HES	25	Collar	42		175	1,085
63	Pellets	GPS	2	Dust	3	Dust	19	HES	3				2	29
64	Pet collar					Dust	1			Collar	5	3	3	23
65	Spot-on			RTU	2	RTU	5	HES	1					9
67	Sprayer, hose-end	HES	11	HES	9	HES	23	HES	10				15	71
68	Sprayer, hand wand/pump/tank	HES	24	HES	136	HES	141	HES	130				46	483
69	Sprayer, backpack			RTU	3	RTU	2							5
70	Sprayer, spritz	HES	1	RTU	2	RTU	10	HES	1	Collar	2		18	49
71	Sprayer, hand trigger	HES	5	RTU	22	RTU	55	HES	23				20	154
72	Other	HES	7	RTU	9	RTU	11	HES	3	Collar	5	6	14	65
-2	Check verbatims			Dust	5	Dust	5	HES	1				5	16
-3	Bad data			Dust	1	Dust	3						1	9
	<blank>	GPS	1	Dust	6	Dust	4						13	30
	Grand Total		126		614		695		205		54	11	791	3,267

Site Groupings: Ornamentals (695) = Ornamental flowers (444), Shrubs/Bushes (248), Aquatic Garden/Pond (3); Trees = Fruit/Nut trees (142), Ornamental/Other type of trees (63); ; Pet Collar, Carbaryl = Dog (30), Cat (22), Other Pet (2);

Since carbaryl products are available in several formulations (dust, liquid, granules), the application method was used to assign all events within the modeled sites to the appropriate NMC Scenario. As Table II.E.1-1 indicates, the REJV respondents reported applying carbaryl to turf via several application methods, including: Granular/Dust/Powder - pour spout, shaker can (65 application events), Sprayer, hand wand/pump/tank (24 events), and Granular - broadcast/rotary spreader (5 events). The Sprayer, hand wand/pump/tank scenario was assigned to Hose-End Spray due to recent regulatory decisions affecting the product labels. Other application methods that did not fit into the scenarios developed for this assessment were assigned to the 'closest' scenario for that site, or to a scenario that was conservative with respect to post-application exposure. For example, the application method for carbaryl applied to lawn was blank for one record, and that event was assigned to Granular Push Spreader to capture post-application to toddlers. Applications to other sites were not considered in this assessment (e.g., carbaryl and/or propoxur use around the house perimeter, wasp/hornet nests, etc.).

There were no reported applications of methiocarb in the REJV data base. However, 4 homeowners reported having one or more products containing methiocarb on hand (ORTHO SLUG-GETA BAIT, EPA REG NO: 239-2416-AA; INV_ID=065277, 096753, 096761, 096761, 100479). Similarly, the REJV survey did not capture professional applications of carbaryl to lawns by Lawn Care Operators (LCOs). The available marketing data suggest relatively low use of these carbamates to residential settings. OPP/BEAD estimated LCOs applied between 40,000 lbs ai – 125,000 lbs ai of carbaryl, less than 1% of all insecticides (lbs ai) applied to residential lawns.[6] The professional use scenarios were not included in this assessment since there is relatively low residential use of carbaryl by LCOs - and since homeowners do not obtain (applicator) exposure from those scenarios.

[6] Estimates of the Non-Agricultural Usage of Carbaryl and Propoxur, Jenna Carter/T. Kiely, OPP/BEAD.

Box II.D.1-1: Possible Approach for Modeling Professional Use

While there are few professional applications (LCO) of carbaryl to residential settings, use estimates (Tables II.G.4, 1.13, 1.14) for such scenarios could be developed in the following manner. As noted above, a total of 70,427 NFO panel members responded to the screener survey. Of this total, 62,611 (89%) reported having a private lawn, and 8,705 (12.3%) reported hiring an Lawn Care Operator (LCO). Those responses may be used to generate application events for these three scenarios. Specifically, only respondents with a yard (lawn) would be allowed to apply methiocarb to control for snails/slugs; such households may be assumed to have a one percent chance of applying methiocarb to ornamental plants. Similarly, and only people that hired a LCO during the last 12 months would be allowed to hire an LCO to apply carbaryl to their lawn; such households may be assumed to have a 10 percent chance of hiring an LCO to apply carbaryl to their lawn. Applying such percentages (conditional probabilities) to the NMC-Scenario-user-application events makes an implicit assumption that these 3 scenario-users are a subset of the NMC-Scenario-users, and that the application dates occurred on the same dates as other NMC-Scenario applications. This approach would be conservative in the sense that it is likely to overestimate co-occurrence; e.g., it would allow a homeowner to treat his lawn, as well as hire an LCO to treat the lawn on the same day.

4. REJV Weights

For economical and practical purposes, only 'users' were enlisted to maintain pesticide use diaries during the data collection phase. Since 'non-users' were not enlisted in this survey, the REJV projects total use for the US population by adjusting the use estimates among the 1,217 completed diaries (users) by multiplying estimates (Percent of Total US Households) by 0.76 to account for the 24% of 'non-users'. [7] Equivalently, the 1,217 households may be considered to represent approximately 1,603 households (1,603 = 1,217 users + 386 non-users). The REJV (NFO) also developed sampling weights for each of the 1,217 households; with those weights

[7] The REJV recalculated sampling weights for the respondents to the Screening Survey (N=70,427) to determine the extent of residential pesticide use among homeowners. Approximately 76% of all households were estimated to make one or more pesticide applications - indoors and/or outdoors - during any given year (slightly higher than the unweighted count/pct of 67% = 47,274/70,427). The NFO developed the weights for the 1217 households that provided 12 months of pesticide use diaries to ensure that the ending sample was representative of the overall U.S. population on the following criteria: (1) geographical region, (2) household income, (3) household size, (4) Age of head of household, (5) Market Size (e.g., MSA) of city/township, (6) presence of kids. The weights range from 0.3 to 3.0, and sum up to 1200. Black and Hispanic populations are known to be under-represented in NFO panel; which the NFO took into account when developing these weights.

summing up to 78,855,307 households, or approximately 76% of all households in the US (Table II.E.1-2). For this NMC CRA, pesticide use statistics were calculated using two methods: (1) a simple count of the number of households, and (2) using the sampling weights for these 1217 households. Since these two application methods produced similar results, we use/present the statistics/results using the simple count method.

Tabel II.D.1-2 Total & Projected Number of Households in REJV Survey

Region	Number of Households with 12 Month Diaries	Proj Number of Households (users+non-users)/1	Proj Number of Households w/12 Month Diaries	Proj Total Number of Household (Users+Nonusers)
US	1,217	1,603	78,855,307	103,885,440
East	171	225	13,500,548	17,785,871
Midwest	261	344	17,983,445	23,691,723
South	501	660	30,237,128	39,834,951
West	284	374	17,134,187	22,572,895

There are high confidence intervals around the REJV estimates due to the infrequent nature of residential pesticide use. This is especially true for the Calendex inputs where use statistics were calculated for each 'User type' – as determined by the total number of applications per year, and further compounded by regional breakouts. The regional statistics are intended to provide additional perspective on the degree of variability in regional use patterns. The primary concern was to capture high-end use patterns as reported by REJV respondents. Concerns regarding statistical reliability may be better addressed with appropriate sensitivity analyses.

As Table II.D.1-3 indicate, the three models (Calendex, CARES and Lifeline) require slightly different set of pesticide use inputs. The following discussion is meant to highlight similarities/differences across the three models; further details regarding these models can be found on the internet sites when each of these models were brought to the SAP. The REJV statistics for the various pesticide use inputs can be found in the Appendix-Tables as indicated in the corresponding cells.

In Calendex, all modeled scenarios are 'custom' –the exposure factors and the pesticide use inputs are not constrained based on any label assigned to that scenario. Distributions need to be specified for all exposure factors in each applicable routes, and the percent of households and all application timing data are specified in that scenario input file. CARES and Lifeline require the users to assign each modeled scenario to a pre-defined category. For any modeled scenario, several common exposure factors (e.g., area treated, application rate, and duration) apply to all exposure routes within the scenario. In CARES, the total percent of households apply to all products within that scenario (e.g., 4% of all Households may make an application to the Garden - that figure includes applications made with any of the 3 modeled scenario-products: RTU, dust-hand, liquid Hose-End Spray). For Lifeline, the percent of households is indirectly determined by the various Target Pest Use Factors (II.E.e., market shares) discussed in further detail below.

Table II.D.1-3: Residential Pesticide Use Inputs for Models

Pesticide Use Input	Calendex	CARES	Lifeline
Scenario Selection	All Scenarios are 'Custom'	17 Scenarios Affect PHT, available algorithms, and possibly co-occurrence	85 Scenarios Affect PHT, potential area treated (AHS/NGS) & duration (NHAPS)
Pct of Households (Product-Scenario)	Apply to Scenario (Table II.E.1-4)	Apply to all uses within Scenario (Tables II.E.1-4 & II.E.1-8)	Target Pest Use Factors via NHGPUS diaries (Table II.E.1-15)
Professional vs Homeowner Applicator	Option Available	Option Available	Option Available
User Type	Defined by Number of Applications & Application Schedules	Single Type for Each Product-Scenario (need multiple 'products')	Types Defined by NHGPUS Diaries (Table II.E.1-15)
Day of Week (Sun-Sat)	Distribution 1st App (Table II.E.1-5)	Distribution All Apps (Table II.E.1-10)	All Application Events Randomly determined based on NHGPUS (#Apps/Yr) & Region. Independent daily Probabilities for North (=#apps/182.5) and South (=#apps/365)
Month or Julian Date (Day/Week of Year)	Apply distribution (CDF) to 1st Application (Table II.E.1-6)	Apply to All Applications (Table II.E.1-11)	
Number of Applications & Interval (Days) Between Applications	Apply to 2nd and subsequent Applications (Table II.E.1-7)	Variable – indirectly related to existing applications (Table II.E.1-9)	
Co-occurrent Use/Exposure Across Scenarios	Four sequential (pair-wise) Links (Table II.E.1-12)	Co-occurrence (Conditional Probability) Matrix (Tables II.E.1-13b & 14b)	NHGPUS Diaries (Partially Independent wrt Daily Probabilities)

The scenario selection has a definitive impact in the Lifeline model since several data bases are empirically built into Lifeline.[8]

The three models provide an option to account for use by professional applicators. In all cases, the modeled individuals obtain only post-application exposure from such uses.

The Calendex model allows for multiple 'user types'. For this assessment, Calendex user types were developed based on the total number of applications made over the year. Calendex requires a cumulative distribution for the date of the first application (by day of year or by week of year, and day of week). If there are multiple user types, then Calendex also requires inputs on the number of days between successive applications for each type. The CARES model can be specified using either a general Scenario category, or using the general Sceanrio cateogory and specifying

[8] For applicator exposure, the amount applied is a function of area treated. Lifeline has built-in distributions for Lawn size (American Housing Survey, Lot size - footprint), garden sizes (National Gardening Survey), and size of Indoor rooms (National Realtors Study). The entire area is generally assumed to be treated in the Lifeline 'Broadcast' scenarios, while a fraction of that total potential area is treated for 'Spot' scenarios.

'user groups'. The first approach assumes a representative user type, and therefore, average values would be inputted for all application schedule inputs, in particular, the average number of applications, average days between applications, distributions for day of week and month of year apply to all applications. These application schedules are applied to all products-application methods modeled within a particular scenario (i.e., dust, RTU and liquid hose-end spray applications to a Garden share the same application schedule). In the latter approach, separate application schedules (i.e., day of week, month, number of applications, interval between applications, and co-occurrence) are inputted for each Scenario-user group.

The Lifeline model utilizes the US EPA National Home and Garden Pesticide Use (NHGPUS) 'diaries' to model residential pesticide use; there are as many user types as distinct diaries.[9] A modeled individual is first (stochastically) determined to be a user or a non-user based on the Target Pests Use Factors inputted for the various products. Table II.E.1-15 presents these inputs for the Lifeline model. For example, carbaryl has 8.6% of the market (total applications) made to control 'plant-chewing insects' on lawn; if 10% of all households applied some insecticide to lawn to control 'plant-chewing insects', then an individual may have approximately 0.86% (=0.1 x 0.086) of applying carbaryl to lawns for this purpose. Once an individual has been determined to be a user, Lifeline calculates a probability of use on any given day based on the total number of applications made during the past 12 months, and the region in which that individual resides. If the NHGPUS diary indicates that two applications were made to lawns over the 12 month period and that individual resides in a Southern state, then the probability of an application on any given day is 0.8% (0.0082=2/365). All application events are randomly (independently) determined for each simulated day.

The three models have different approaches to account for co-occurrent use patterns. In Calendex, all scenarios are listed in an 'AGM' file, and the user may specify one of four types of linkages: 3 pair-wise numeric links and alphabetical type of link. The numeric links define correlations between the application(s) of one scenario with the application(s) of the preceding scenario: Code '2' forces a scenario to have identical application date(s) as the preceding scenario - this linkage requires both scenarios to have the same application schedules; Code '3' is similar to Code '2', but forces the same date only for the first application; and Code '4' forces the application of that scenario when the previous scenario was used, but application schedules (number of applications and dates) may be different. Alphabetical codes are used to model 'mutually independent' events (e.g., may want to have users affix only one of two potential pet collars to a pet). The alphabetical links may be assigned to two or more scenarios (e.g., select 1 of 2 pet collars). Table II.E.1-12 presents alternative links for a Calendex simulation based on the conditional probabilities in the co-occurrence matrix (further discussion below).

[9] The Lifeline model randomly assigns a (12 month recall) NHGPUS diary to each modeled individual based on several demographic characteristics. The diary applies to that individual as long as s/he remains in the same residence. If s/he moves, then a new diary is randomly selected from the appropriate bin.

CARES uses a 'co-occurrence matrix' to account for correlations across residential use scenarios.[10] Table II.E.1-13b presents the Co-occurrence matrix based on the various scenario-sites. The matrix contains conditional probabilities, and is read by row, as follows: "For a modeled individual that treated both their lawn and garden, for each lawn application event, there is a 36% (=28/78) chance that the ornamental plants were treated on the same day, a 9% chance that trees were treated on the same day, an 8% chance that the garden was treated on the same day, and a 0% chance that pets were treated on the same day."[11] Table II.E.1-12b provides a more refined co-occurrence by scenario.

Table II.E.1-14b presents a co-occurrence matrix that was generated for the various scenarios (product-site-application method). This co-occurrence matrix may provide stronger correlations across products. For example, an individual that treated his/her lawn with a dust formulation is more likely to continue applying that same product to their ornamental plants, garden and/or trees, than selecting another product (such as a liquid concentrate applied using a hand wand) to treat those sites. That anecdotal practice is reflected in this co-occurrence matrix. In order to utilize these inputs, the CARES scenarios need to be individually grouped by each modeled scenario (formulation-application method). The conditional probabilities in this co-occurrence matrix can also be used as a general guide for setting Calendex linkages. A cursory review of this table indicates that between 22% and 25% of the time, individuals that applied a carbaryl product (dust or liquid) to their garden also treated their ornamental plants on the same day. Based on similar figures for other product-site combinations, the 25% figure was provided in the Calendex links (Type 4 – 1st application on the same date) for products applied to different sites.

As noted above, Lifeline empirically utilizes the NHGPUS diaries. A modeled individual may apply one or more products to multiple sites on a given day based upon the probabilities calculated for each product(s) to the various sites. Continuing with the example above, if the diary indicates two applications were made to lawn and two applications are made to garden, then the probability of applying carbaryl each of these sites on any given day is 0.8% (0.0082=2/365). While there is a good chance that the individual will make at least one application to both sites at some point during the year, the probability that a modeled individual will treat both sites on the same day is very low since applications to each site are independently determined.

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[10] For each modeled individual, CARES determines the permutation of use scenarios affecting that modeled individual during some time during the year; each scenario is independently determined based on the scenario probabilities (Table II.G.4). If multiple scenarios are affected, a dominant scenario is selected and an application date determined based on the seasonal use patterns (Table II.G.10, 1.11). The co-occurrence matrix (Table II.G.13b or II.G.14b) provide conditional probabilities of treating the other scenario(s)-site(s) on that same date. Subsequent applications for the dominant scenario are determined based on the seasonal use patterns, and the Interval between applications (Table II.G.9).

[11] The '1s' on the diagonals indicate that use occurred on that site; CARES requires the user to enter '0' instead of '1'.

Table II.D.1-4: Total Number of Households in REJV that applied N-Methyl Carbamates

Scenario_NMC	Total Number of Households Applying Product (1+ Apps), Among 1,217 Households					Percent of Households Applying Product (1+ Apps), Among Projected 1603 Households				
	US	East	Midwest	South	West	US	East	Midwest	South	West
Garden_All	97	10	26	46	15	6%	4%	8%	7%	4%
Carbaryl_GardenDust	82	8	25	37	12	5%	4%	7%	6%	3%
Carbaryl_GardenHES	24	4	4	12	4	1%	2%	1%	2%	1%
Carbaryl_GardenRTU	11	2	3	6		1%	1%	1%	1%	0%
Lawn_All	33	4	6	21	2	2%	2%	2%	3%	1%
Carbaryl_LawnDust	18	2	1	15		1%	1%	0%	2%	0%
Carbaryl_LawnGPS	2		2			0%	0%	1%	0%	0%
Carbaryl_LawnHES	16	2	4	8	2	1%	1%	1%	1%	1%
Carbaryl_Lawn_LCO /1	15	2	5	4	4	1%	1%	1%	1%	1%
Ornamentals_All	107	10	26	52	19	7%	4%	8%	8%	5%
Carbaryl_OrnamentalDust	70	3	20	35	12	4%	1%	6%	5%	3%
Carbaryl_OrnamentalHES	25	4	5	10	6	2%	2%	1%	2%	2%
Carbaryl_OrnamentalRTU	21	2	3	12	4	1%	1%	1%	2%	1%
Methiocarb_Ornamental /1						1%	1%	1%	1%	1%
Pet_All	15	3	1	8	3	1%	1%	0%	1%	1%
Carbaryl_PetCollar	12		1	8	3	1%	0%	0%	1%	1%
Propoxur_PetCollar	3	3				0%	1%	0%	0%	0%
Carbaryl_TreeHES	36	7	7	17	5	2%	3%	2%	3%	1%

Table II.D.1-5: Distribution of 1st Application, by Day of Week

Region	NMC Scenario	Distribution of 1st Application (Pct), By DayOfWeek						
		Sun	Mon	Tue	Wed	Thu	Fri	Sat
East	Carbaryl_GardenDust	25	13	25	13	25		
East	Carbaryl_GardenHES		25			25	25	25
East	Carbaryl_GardenRTU		50					50
East	Carbaryl_LawnDust	50				50		
East	Carbaryl_LawnHES					50		50
East	Carbaryl_OrnamentalDust	33		33		33		
East	Carbaryl_OrnamentalHES				25	25	25	25
East	Carbaryl_OrnamentalRTU		50				50	
East	Carbaryl_TreeHES			14	29	14		43
East	Propoxur_PetCollar				33	33		33
Midwest	Carbaryl_GardenDust	12	28	20	8	12	4	16
Midwest	Carbaryl_GardenHES		50					50
Midwest	Carbaryl_GardenRTU			33		33		33
Midwest	Carbaryl_LawnDust						100	
Midwest	Carbaryl_LawnGPS			50			50	
Midwest	Carbaryl_LawnHES		100					
Midwest	Carbaryl_OrnamentalDust	15	15	10	15	25	15	5
Midwest	Carbaryl_OrnamentalHES		60			20		20
Midwest	Carbaryl_OrnamentalRTU	33	33			33		
Midwest	Carbaryl_PetCollar	100						
Midwest	Carbaryl_TreeHES	29		29			29	14
South	Carbaryl_GardenDust	11	19	19	8	19	3	22
South	Carbaryl_GardenHES			25	8	17	25	25
South	Carbaryl_GardenRTU	17		33		17		33
South	Carbaryl_LawnDust	20	20		27		20	13
South	Carbaryl_LawnHES			13	13	38		38
South	Carbaryl_OrnamentalDust	17	14	14	9	17	14	14
South	Carbaryl_OrnamentalHES			30		50	20	
South	Carbaryl_OrnamentalRTU	17	17	17	25	17		8
South	Carbaryl_PetCollar		63	13		13		13
South	Carbaryl_TreeHES	6	24	12	6	35	12	6
West	Carbaryl_GardenDust		17	17	17	8	17	25
West	Carbaryl_GardenHES				25	50	25	
West	Carbaryl_LawnHES					50		50
West	Carbaryl_OrnamentalDust	25		17	25	17	8	8

Region	NMC Scenario	Distribution of 1st Application (Pct), By DayOfWeek						
		Sun	Mon	Tue	Wed	Thu	Fri	Sat
West	Carbaryl_OrnamentalHES	17	17		17	33	17	
West	Carbaryl_OrnamentalRTU		50	25			25	
West	Carbaryl_PetCollar				33	67		
West	Carbaryl_TreeHES		20	20		20	40	
US Total	Carbaryl_GardenDust	11	5	18	21	20	10	16
US Total	Carbaryl_GardenHES		21	25	13	13	8	21
US Total	Carbaryl_GardenRTU	9		36	9	27		18
US Total	Carbaryl_LawnDust	22	22	11	17		22	6
US Total	Carbaryl_LawnGPS		50			50		
US Total	Carbaryl_LawnHES			31	25	6	6	31
US Total	Carbaryl_OrnamentalDust	19	13	10	11	14	13	20
US Total	Carbaryl_OrnamentalHES	4	16	8	16	12	8	36
US Total	Carbaryl_OrnamentalRTU	14	10	5	29	14	14	14
US Total	Carbaryl_PetCollar	8		8	42	8	8	25
US Total	Carbaryl_TreeHES	8	17	14	14	17	8	22
US Total	Propoxur_PetCollar			33			33	33

Table II.D.1-6: Distribution of Date of 1st Application

Region	Scenario_NMC			CDF for 1st Application (All User Types)											
		n	mean	Pct_0_1	Pct_1	Pct_10	Pct_20	Pct_30	Pct_40	Pct_50	Pct_60	Pct_70	Pct_80	Pct_90	Pct_100
East	Carbaryl_GardenDust	8	186	147	147	147	160	160	166	169	172	186	238	255	255
East	Carbaryl_GardenHES	4	183	146	146	146	146	148	148	181	213	213	226	226	226
East	Carbaryl_GardenRTU	2	213	177	177	177	177	177	177	213	248	248	248	248	248
East	Carbaryl_LawnDust	2	217	203	203	203	203	203	203	217	230	230	230	230	230
East	Carbaryl_LawnHES	2	193	160	160	160	160	160	160	193	226	226	226	226	226
East	Carbaryl_OrnamentalDust	3	176	123	123	123	123	123	147	147	147	258	258	258	258
East	Carbaryl_OrnamentalHES	4	133	105	105	105	105	132	132	134	135	135	159	159	159
East	Carbaryl_OrnamentalRTU	2	233	190	190	190	190	190	190	233	276	276	276	276	276
East	Carbaryl_TreeHES	7	152	109	109	109	113	124	124	130	139	139	149	303	303
East	Propoxur_PetCollar	3	154	121	121	121	121	121	166	166	166	174	174	174	174
Midwest	Carbaryl_GardenDust	25	180	124	124	129	135	137	160	181	196	199	207	248	277
Midwest	Carbaryl_GardenHES	4	167	129	129	129	129	135	135	157	178	178	226	226	226
Midwest	Carbaryl_GardenRTU	3	212	184	184	184	184	184	188	188	188	263	263	263	263
Midwest	Carbaryl_LawnDust	1	176	176	176	176	176	176	176	176	176	176	176	176	176
Midwest	Carbaryl_LawnGPS	2	110	108	108	108	108	108	108	110	112	112	112	112	112
Midwest	Carbaryl_LawnHES	4	162	107	107	107	107	150	150	161	171	171	220	220	220
Midwest	Carbaryl_OrnamentalDust	20	182	109	109	124	139	157	167	179	201	213	223	235	264
Midwest	Carbaryl_OrnamentalHES	5	163	125	125	125	138	150	161	171	178	184	185	185	185
Midwest	Carbaryl_OrnamentalRTU	3	222	188	188	188	188	188	220	220	220	259	259	259	259
Midwest	Carbaryl_PetCollar	1	126	126	126	126	126	126	126	126	126	126	126	126	126
Midwest	Carbaryl_TreeHES	7	149	108	108	108	111	133	133	137	176	176	184	197	197
South	Carbaryl_GardenDust	37	155	100	100	110	125	132	137	144	149	164	186	241	267
South	Carbaryl_GardenHES	12	159	96	96	108	127	130	134	148	162	172	201	205	275
South	Carbaryl_GardenRTU	6	136	103	103	103	123	123	133	134	135	158	158	163	163
South	Carbaryl_LawnDust	15	164	29	29	64	99	109	125	147	161	234	248	276	343
South	Carbaryl_LawnHES	8	153	66	66	66	103	110	135	142	149	166	188	310	310
South	Carbaryl_OrnamentalDust	35	153	69	69	87	125	129	133	135	154	170	190	196	343
South	Carbaryl_OrnamentalHES	10	141	54	54	60	85	115	137	152	164	171	173	209	244
South	Carbaryl_OrnamentalRTU	12	160	103	103	109	125	133	140	147	166	171	192	221	270
South	Carbaryl_PetCollar	8	177	107	107	107	129	136	144	157	170	195	248	283	283
South	Carbaryl_TreeHES	17	147	93	93	103	106	114	117	140	169	172	179	204	237
West	Carbaryl_GardenDust	12	155	116	116	117	122	123	134	139	143	156	186	236	253
West	Carbaryl_GardenHES	4	181	145	145	145	145	162	162	172	181	181	237	237	237
West	Carbaryl_LawnHES	2	211	181	181	181	181	181	181	211	240	240	240	240	240

Region	Scenario_NMC			CDF for 1st Application (All User Types)											
		n	mean	Pct_0_1	Pct_1	Pct_10	Pct_20	Pct_30	Pct_40	Pct_50	Pct_60	Pct_70	Pct_80	Pct_90	Pct_100
West	Carbaryl_OrnamentalDust	12	138	48	48	56	87	89	95	117	133	145	181	242	345
West	Carbaryl_OrnamentalHES	6	172	152	152	152	162	162	167	169	171	181	181	196	196
West	Carbaryl_OrnamentalRTU	4	152	141	141	141	141	143	143	147	150	150	172	172	172
West	Carbaryl_PetCollar	3	134	33	33	33	33	33	138	138	138	230	230	230	230
West	Carbaryl_TreeHES	5	200	100	100	100	124	148	165	181	217	253	286	319	319
US Total	Carbaryl_GardenDust	82	165	100	100	122	129	135	142	149	166	186	198	241	277
US Total	Carbaryl_GardenHES	24	168	96	96	127	130	145	146	156	172	181	213	226	275
US Total	Carbaryl_GardenRTU	11	170	103	103	123	133	135	158	163	177	184	188	248	263
US Total	Carbaryl_LawnDust	18	171	29	29	64	100	124	147	161	176	230	246	276	343
US Total	Carbaryl_LawnGPS	2	110	108	108	108	108	108	108	110	112	112	112	112	112
US Total	Carbaryl_LawnHES	16	168	66	66	103	110	135	150	163	171	188	220	240	310
US Total	Carbaryl_OrnamentalDust	70	160	48	48	88	122	129	134	147	167	184	201	234	345
US Total	Carbaryl_OrnamentalHES	25	152	54	54	103	126	135	151	159	168	171	178	185	244
US Total	Carbaryl_OrnamentalRTU	21	174	103	103	125	140	142	150	166	172	190	220	259	276
US Total	Carbaryl_PetCollar	12	162	33	33	107	126	129	136	141	170	195	230	248	283
US Total	Carbaryl_TreeHES	36	156	93	93	103	109	114	133	140	149	176	184	237	319
US Total	Propoxur_PetCollar	3	154	121	121	121	121	121	166	166	166	174	174	174	174

Table II.D.1-7: Distribution of Date of 2nd and Subsequent Applications

Region	Scenario_NMC	Apps /Yr	NHH	PCT	Average Days Between Applications																													
					2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
East	Carbaryl_GardenDust	1	4	50.0																														
East	Carbaryl_GardenDust	2	3	37.5	19																													
East	Carbaryl_GardenDust	5	1	12.5	1	4	8	11																										
East	Carbaryl_GardenHES	1	1	25.0																														
East	Carbaryl_GardenHES	3	2	50.0	12	41																												
East	Carbaryl_GardenHES	8	1	25.0	11	8	14	14	10	21	39																							
East	Carbaryl_GardenRTU	1	1	50.0																														
East	Carbaryl_GardenRTU	2	1	50.0	8																													
East	Carbaryl_LawnDust	1	2	100.0																														
East	Carbaryl_LawnHES	2	1	50.0	77																													
East	Carbaryl_LawnHES	4	1	50.0	8	2	4																											
East	Carbaryl_OrnamentalDust	1	2	66.7																														
East	Carbaryl_OrnamentalDust	3	1	33.3	35	9																												
East	Carbaryl_OrnamentalHES	1	3	75.0																														
East	Carbaryl_OrnamentalHES	4	1	25.0	36	31	77																											
East	Carbaryl_OrnamentalRTU	1	1	50.0																														
East	Carbaryl_OrnamentalRTU	3	1	50.0	25	10																												
East	Carbaryl_TreeHES	1	3	42.9																														
East	Carbaryl_TreeHES	4	2	28.6	17	41	34																											
East	Carbaryl_TreeHES	5	1	14.3	48	31	9	14																										
East	Carbaryl_TreeHES	6	1	14.3	30	24	22	10	28																									
East	Propoxur_PetCollar	1	1	33.3																														
East	Propoxur_PetCollar	2	1	33.3	40																													
East	Propoxur_PetCollar	6	1	33.3	31	30	31	31	30																									
Midwest	Carbaryl_GardenDust	1	10	40.0																														
Midwest	Carbaryl_GardenDust	2	5	20.0	14																													
Midwest	Carbaryl_GardenDust	3	2	8.0	20	14																												
Midwest	Carbaryl_GardenDust	4	2	8.0	33	12	13																											
Midwest	Carbaryl_GardenDust	5	1	4.0	25	16	9	44																										
Midwest	Carbaryl_GardenDust	6	3	12.0	22	4	6	7	25																									
Midwest	Carbaryl_GardenDust	9	1	4.0	12	12	6	3	5	13	8	4																						
Midwest	Carbaryl_GardenDust	11	1	4.0	6	23	16	10	6	2	3	20	5	20																				
Midwest	Carbaryl_GardenHES	1	3	75.0																														
Midwest	Carbaryl_GardenHES	4	1	25.0	5	5	61																											
Midwest	Carbaryl_GardenRTU	1	2	66.7																														

Region	Scenario_NMC	Apps /Yr	NHH	PCT	Average Days Between Applications																													
					2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Midwest	Carbaryl_GardenRTU	2	1	33.3	6																													
Midwest	Carbaryl_LawnDust	2	1	100.0	3																													
Midwest	Carbaryl_LawnGPS	1	2	100.0																														
Midwest	Carbaryl_LawnHES	1	2	50.0																														
Midwest	Carbaryl_LawnHES	2	1	25.0	33																													
Midwest	Carbaryl_LawnHES	7	1	25.0	18	5	16	13	9	6																								
Midwest	Carbaryl_OrnamentalDust	1	10	50.0																														
Midwest	Carbaryl_OrnamentalDust	2	6	30.0	23																													
Midwest	Carbaryl_OrnamentalDust	3	1	5.0	40	35																												
Midwest	Carbaryl_OrnamentalDust	4	1	5.0	56	3	7																											
Midwest	Carbaryl_OrnamentalDust	5	1	5.0	5	61	14	27																										
Midwest	Carbaryl_OrnamentalDust	7	1	5.0	3	5	3	5	10	8																								
Midwest	Carbaryl_OrnamentalHES	1	1	20.0																														
Midwest	Carbaryl_OrnamentalHES	2	2	40.0	9																													
Midwest	Carbaryl_OrnamentalHES	3	1	20.0	1	32																												
Midwest	Carbaryl_OrnamentalHES	7	1	20.0	18	5	16	13	9	6																								
Midwest	Carbaryl_OrnamentalRTU	1	3	100.0																														
Midwest	Carbaryl_PetCollar	1	1	100.0																														
Midwest	Carbaryl_TreeHES	1	3	42.9																														
Midwest	Carbaryl_TreeHES	2	3	42.9	9																													
Midwest	Carbaryl_TreeHES	3	1	14.3	12	10																												
South	Carbaryl_GardenDust	1	13	35.1																														
South	Carbaryl_GardenDust	2	10	27.0	20																													
South	Carbaryl_GardenDust	3	8	21.6	12	24																												
South	Carbaryl_GardenDust	4	1	2.7	107	11	68																											
South	Carbaryl_GardenDust	5	3	8.1	17	13	15	14																										
South	Carbaryl_GardenDust	7	2	5.4	22	8	3	13	8	9																								
South	Carbaryl_GardenHES	1	6	50.0																														
South	Carbaryl_GardenHES	3	1	8.3	10	3																												
South	Carbaryl_GardenHES	4	1	8.3	4	11	33																											
South	Carbaryl_GardenHES	5	1	8.3	14	96	14	14																										
South	Carbaryl_GardenHES	6	1	8.3	11	26	7	9	21																									
South	Carbaryl_GardenHES	7	1	8.3	5	4	16	1	2	21																								
South	Carbaryl_GardenHES	8	1	8.3	2	5	7	5	4	17	13																							
South	Carbaryl_GardenRTU	1	2	33.3																														
South	Carbaryl_GardenRTU	2	2	33.3	15																													

					Average Days Between Applications																													
Region	Scenario_NMC	Apps /Yr	NHH	PCT	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
South	Carbaryl_GardenRTU	3	1	16.7	13	8																												
South	Carbaryl_GardenRTU	8	1	16.7	17	32	15	7	12	23	18																							
South	Carbaryl_LawnDust	1	9	60.0																														
South	Carbaryl_LawnDust	2	2	13.3	14																													
South	Carbaryl_LawnDust	3	1	6.7	74	7																												
South	Carbaryl_LawnDust	4	1	6.7	1	6	4																											
South	Carbaryl_LawnDust	5	1	6.7	115	14	20	6																										
South	Carbaryl_LawnDust	16	1	6.7	26	21	7	5	2	6	5	44	39	17	45	18	5	12	9															
South	Carbaryl_LawnHES	1	6	75.0																														
South	Carbaryl_LawnHES	2	1	12.5	43																													
South	Carbaryl_LawnHES	3	1	12.5	128	45																												
South	Carbaryl_OrnamentalDust	1	13	37.1																														
South	Carbaryl_OrnamentalDust	2	10	28.6	41																													
South	Carbaryl_OrnamentalDust	3	5	14.3	20	26																												
South	Carbaryl_OrnamentalDust	4	3	8.6	8	18	15																											
South	Carbaryl_OrnamentalDust	5	1	2.9	50	5	31	113																										
South	Carbaryl_OrnamentalDust	6	2	5.7	27	12	6	11	21																									
South	Carbaryl_OrnamentalDust	7	1	2.9	61	31	25	15	14	5																								
South	Carbaryl_OrnamentalHES	1	2	20.0																														
South	Carbaryl_OrnamentalHES	2	2	20.0	38																													
South	Carbaryl_OrnamentalHES	3	2	20.0	9	13																												
South	Carbaryl_OrnamentalHES	4	4	40.0	41	35	19																											
South	Carbaryl_OrnamentalRTU	1	8	66.7																														
South	Carbaryl_OrnamentalRTU	4	3	25.0	36	8	23																											
South	Carbaryl_OrnamentalRTU	11	1	8.3	19	11	8	9	6	10	16	9	12	15																				
South	Carbaryl_PetCollar	1	5	62.5																														
South	Carbaryl_PetCollar	2	2	25.0	58																													
South	Carbaryl_PetCollar	6	1	12.5	11	2	14	9	1																									
South	Carbaryl_TreeHES	1	9	52.9																														
South	Carbaryl_TreeHES	2	4	23.5	45																													
South	Carbaryl_TreeHES	4	2	11.8	5	8	21																											
South	Carbaryl_TreeHES	7	1	5.9	6	24	8	21	11	24																								
South	Carbaryl_TreeHES	8	1	5.9	17	14	18	15	7	12	58																							
West	Carbaryl_GardenDust	1	6	50.0																														
West	Carbaryl_GardenDust	2	2	16.7	12																													
West	Carbaryl_GardenDust	3	4	33.3	31	25																												

Region	Scenario_NMC	Apps /Yr	NHH	PCT	Average Days Between Applications																													
					2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
West	Carbaryl_GardenHES	1	2	50.0																														
West	Carbaryl_GardenHES	2	1	25.0	34																													
West	Carbaryl_GardenHES	4	1	25.0	39	18	21																											
West	Carbaryl_LawnHES	1	1	50.0																														
West	Carbaryl_LawnHES	2	1	50.0	47																													
West	Carbaryl_OrnamentalDust	1	5	41.7																														
West	Carbaryl_OrnamentalDust	2	4	33.3	78																													
West	Carbaryl_OrnamentalDust	4	1	8.3	13	34	4																											
West	Carbaryl_OrnamentalDust	5	2	16.7	51	33	34	30																										
West	Carbaryl_OrnamentalHES	1	3	50.0																														
West	Carbaryl_OrnamentalHES	3	1	16.7	10	11																												
West	Carbaryl_OrnamentalHES	4	1	16.7	39	18	21																											
West	Carbaryl_OrnamentalHES	6	1	16.7	7	9	14	10	8																									
West	Carbaryl_OrnamentalRTU	1	3	75.0																														
West	Carbaryl_OrnamentalRTU	2	1	25.0	109																													
West	Carbaryl_PetCollar	1	2	66.7																														
West	Carbaryl_PetCollar	6	1	33.3	28	33	161	1	5																									
West	Carbaryl_TreeHES	1	3	60.0																														
West	Carbaryl_TreeHES	2	1	20.0	68																													
West	Carbaryl_TreeHES	3	1	20.0	39	18																												
US Total	Carbaryl_GardenDust	1	33	40.2																														
US Total	Carbaryl_GardenDust	2	20	24.4	17																													
US Total	Carbaryl_GardenDust	3	14	17.1	18	23																												
US Total	Carbaryl_GardenDust	4	3	3.7	57	11	31																											
US Total	Carbaryl_GardenDust	5	5	6.1	15	12	12	19																										
US Total	Carbaryl_GardenDust	6	3	3.7	22	4	6	7	25																									
US Total	Carbaryl_GardenDust	7	2	2.4	22	8	3	13	8	9																								
US Total	Carbaryl_GardenDust	9	1	1.2	12	12	6	3	5	13	8	4																						
US Total	Carbaryl_GardenDust	11	1	1.2	6	23	16	10	6	2	3	20	5	20																				
US Total	Carbaryl_GardenHES	1	12	50.0																														
US Total	Carbaryl_GardenHES	2	1	4.2	34																													
US Total	Carbaryl_GardenHES	3	3	12.5	11	28																												
US Total	Carbaryl_GardenHES	4	3	12.5	16	11	38																											
US Total	Carbaryl_GardenHES	5	1	4.2	14	96	14	14																										
US Total	Carbaryl_GardenHES	6	1	4.2	11	26	7	9	21																									
US Total	Carbaryl_GardenHES	7	1	4.2	5	4	16	1	2	21																								

Region	Scenario_NMC	Apps /Yr	NHH	PCT	Average Days Between Applications																													
					2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
US Total	Carbaryl_GardenHES	8	2	8.3	7	7	11	10	7	19	26																							
US Total	Carbaryl_GardenRTU	1	5	45.5																														
US Total	Carbaryl_GardenRTU	2	4	36.4	11																													
US Total	Carbaryl_GardenRTU	3	1	9.1	13	8																												
US Total	Carbaryl_GardenRTU	8	1	9.1	17	32	15	7	12	23	18																							
US Total	Carbaryl_LawnDust	1	11	61.1																														
US Total	Carbaryl_LawnDust	2	3	16.7	10																													
US Total	Carbaryl_LawnDust	3	1	5.6	74	7																												
US Total	Carbaryl_LawnDust	4	1	5.6	1	6	4																											
US Total	Carbaryl_LawnDust	5	1	5.6	115	14	20	6																										
US Total	Carbaryl_LawnDust	16	1	5.6	26	21	7	5	2	6	5	44	39	17	45	18	5	12	9															
US Total	Carbaryl_LawnGPS	1	2	100.0																														
US Total	Carbaryl_LawnHES	1	9	56.3																														
US Total	Carbaryl_LawnHES	2	4	25.0	50																													
US Total	Carbaryl_LawnHES	3	1	6.3	128	45																												
US Total	Carbaryl_LawnHES	4	1	6.3	8	2	4																											
US Total	Carbaryl_LawnHES	7	1	6.3	18	5	16	13	9	6																								
US Total	Carbaryl_OrnamentalDust	1	30	42.9																														
US Total	Carbaryl_OrnamentalDust	2	20	28.6	43																													
US Total	Carbaryl_OrnamentalDust	3	7	10.0	25	25																												
US Total	Carbaryl_OrnamentalDust	4	5	7.1	19	18	11																											
US Total	Carbaryl_OrnamentalDust	5	4	5.7	39	33	28	50																										
US Total	Carbaryl_OrnamentalDust	6	2	2.9	27	12	6	11	21																									
US Total	Carbaryl_OrnamentalDust	7	2	2.9	32	18	14	10	12	7																								
US Total	Carbaryl_OrnamentalHES	1	9	36.0																														
US Total	Carbaryl_OrnamentalHES	2	4	16.0	24																													
US Total	Carbaryl_OrnamentalHES	3	4	16.0	7	17																												
US Total	Carbaryl_OrnamentalHES	4	6	24.0	40	32	29																											
US Total	Carbaryl_OrnamentalHES	6	1	4.0	7	9	14	10	8																									
US Total	Carbaryl_OrnamentalHES	7	1	4.0	18	5	16	13	9	6																								
US Total	Carbaryl_OrnamentalRTU	1	15	71.4																														
US Total	Carbaryl_OrnamentalRTU	2	1	4.8	109																													
US Total	Carbaryl_OrnamentalRTU	3	1	4.8	25	10																												
US Total	Carbaryl_OrnamentalRTU	4	3	14.3	36	8	23																											
US Total	Carbaryl_OrnamentalRTU	11	1	4.8	19	11	8	9	6	10	16	9	12	15																				
US Total	Carbaryl_PetCollar	1	8	66.7																														

Region	Scenario_NMC	Apps /Yr	NHH	PCT	Average Days Between Applications																													
					2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
US Total	Carbaryl_PetCollar	2	2	16.7	58																													
US Total	Carbaryl_PetCollar	6	2	16.7	20	18	88	5	3																									
US Total	Carbaryl_TreeHES	1	18	50.0																														
US Total	Carbaryl_TreeHES	2	8	22.2	34																													
US Total	Carbaryl_TreeHES	3	2	5.6	26	14																												
US Total	Carbaryl_TreeHES	4	4	11.1	11	24	27																											
US Total	Carbaryl_TreeHES	5	1	2.8	48	31	9	14																										
US Total	Carbaryl_TreeHES	6	1	2.8	30	24	22	10	28																									
US Total	Carbaryl_TreeHES	7	1	2.8	6	24	8	21	11	24																								
US Total	Carbaryl_TreeHES	8	1	2.8	17	14	18	15	7	12	58																							
US Total	Propoxur_PetCollar	1	1	33.3																														
US Total	Propoxur_PetCollar	2	1	33.3	40																													
US Total	Propoxur_PetCollar	6	1	33.3	31	30	31	31	30																									

Table II.D.1-8: Market Shares for each CARES' Scenario, By NMC Scenario

Scenario_NMC	Total Number of Applications (1217 HHs)					Market Share-Applications (1217 HHs)				
	US	East	Midwest	South	West	US	East	Midwest	South	West
Carbaryl_GardenDust	204	15	77	90	22	69%	45%	88%	62%	73%
Carbaryl_GardenHES	69	15	7	39	8	23%	45%	8%	27%	27%
Carbaryl_GardenRTU	24	3	4	17		8%	9%	5%	12%	0%
Carbaryl_LawnDust	45	2	2	41		58%	25%	13%	79%	0%
Carbaryl_LawnGPS	2		2			3%	0%	13%	0%	0%
Carbaryl_LawnHES	31	6	11	11	3	40%	75%	73%	21%	100%
Carbaryl_OrnamentalDust	157	5	41	84	27	59%	31%	69%	59%	56%
Carbaryl_OrnamentalHES	66	7	15	28	16	25%	44%	25%	20%	33%
Carbaryl_OrnamentalRTU	43	4	3	31	5	16%	25%	5%	22%	10%
Carbaryl_PetCollar	24		1	15*	8	73%	0%	100%	100%	100%
Carbaryl_TreeHES	82	22	12	40	8	100%	100%	100%	100%	100%
Propoxur_PetCollar	9	9				27%	100%	0%	0%	0%
Total Applications	1406	240	247	656	263					

The total number of applications (N=1406) is based on the 1217 households that provided 12 months of pesticide use diaries; the households that provided less than 12 months of pesticide use diaries made a total of N=1190. The total number of applications (By Scenario_NMC) is still less than the number suggested in Table B.1.2 (N=3307); since an application to multiple REJV sites within a NMC Scenario group is considered one application to that site (per discussion above); e.g., someone treating both ornamental flowers, and shrubs/bushes on a single day is considered to have made one application to 'Ornamental' plants.

Table II.D.1-9 Average Number of Applications/Year & Interval Between Applications

Scenario_NMC	Average Number of Applications/Yr/HH					Average Days Between Applications				
	East	Midwest	South	West	US Total	East	Midwest	South	West	US Total
Garden-All Scenarios	2	3	3	2	3	16	14	17	25	17
Carbaryl_GardenDust	2	3	2	2	2	11	14	18	24	16
Carbaryl_GardenHES	4	2	3	2	3	20	24	14	28	17
Carbaryl_GardenRTU	2	1.3	3		2	8	6	16		15
Lawn-All Scenarios	2	2	2	2	2	23	13	26	47	24
Carbaryl_LawnDust	1.0	2	3		3		3	21		20
Carbaryl_LawnGPS		1.0			1.0					
Carbaryl_LawnHES	3	3	1.4	2	2	23	14	72	47	30
Ornamental-All Scenarios	2	2	3	2	2	32	17	24	35	25
Carbaryl_OrnamentalDust	2	2	2	2	2	22	20	26	44	28
Carbaryl_OrnamentalHES	2	3	3	3	3	48	12	28	15	22
Carbaryl_OrnamentalRTU	2	1.0	3	1.3	2	18		17	109	21
Carbaryl_TreeHES	3	2	2	2	2	27	10	21	42	23
Pet-All Scenarios	3	1.0	2	3	2	32		22	46	32
Carbaryl_PetCollar		1.0	2	3	2			22	46	32
Propoxur_PetCollar	3				3	32				32

Table II.D.1-10: Distribution of All Applications, by Day of Week

Region	NMC Scenario	Distribution of All Applications (Pct), By DayOfWeek						
		Sun	Mon	Tue	Wed	Thu	Fri	Sat
East	Carbaryl_GardenDust	10	21	3	21	21	10	14
East	Carbaryl_GardenHES	9	11	18	16	9	7	30
East	Carbaryl_GardenRTU	14		14	29	14		29
East	Carbaryl_LawnDust	33						67
East	Carbaryl_LawnGPS		100					
East	Carbaryl_LawnHES	20	10	30				40
East	Carbaryl_OrnamentalDust	22	13	9	9	17	9	22
East	Carbaryl_OrnamentalHES	5	16	21	21		16	21
East	Carbaryl_OrnamentalRTU		50	7	7	14	7	14
East	Carbaryl_PetCollar						100	
East	Carbaryl_TreeHES	11	9	26	15	13	9	17
East	Propoxur_PetCollar	18	9	9	9	9	27	18
Midwest	Carbaryl_GardenDust	12	12	15	16	18	10	17
Midwest	Carbaryl_GardenHES	11	11	21	32		16	11
Midwest	Carbaryl_GardenRTU		25	13	13	25	13	13
Midwest	Carbaryl_LawnDust		33			33	33	
Midwest	Carbaryl_LawnGPS		33			33	33	
Midwest	Carbaryl_LawnHES	19	19	6	25		19	13
Midwest	Carbaryl_OrnamentalDust	17	11	12	16	16	9	17
Midwest	Carbaryl_OrnamentalHES	20	10	7	13	23	13	13
Midwest	Carbaryl_OrnamentalRTU	10	20		20		10	40
Midwest	Carbaryl_PetCollar	29	43		29			
Midwest	Carbaryl_TreeHES	9	11	9	16	27	14	14
South	Carbaryl_GardenDust	13	13	18	13	14	11	19
South	Carbaryl_GardenHES	4	22	10	13	17	14	21
South	Carbaryl_GardenRTU	13	10	13	19	13	16	16
South	Carbaryl_LawnDust	20	14	8	14	10	24	10
South	Carbaryl_LawnGPS		50		50			
South	Carbaryl_LawnHES	10	5	19	5	19	24	19
South	Carbaryl_OrnamentalDust	16	14	10	14	15	14	18
South	Carbaryl_OrnamentalHES	4	10	19	8	13	15	31
South	Carbaryl_OrnamentalRTU	14	8	14	15	14	22	14
South	Carbaryl_PetCollar	16	7	3	27	13	7	27
South	Carbaryl_TreeHES	9	14	14	14	8	22	20
West	Carbaryl_GardenDust	12	12	22	16	9	20	8

Region	NMC Scenario	Distribution of All Applications (Pct), By DayOfWeek						
		Sun	Mon	Tue	Wed	Thu	Fri	Sat
West	Carbaryl_GardenHES	30	10		20		20	20
West	Carbaryl_GardenRTU						100	
West	Carbaryl_LawnDust	60					20	20
West	Carbaryl_LawnGPS	67				33		
West	Carbaryl_LawnHES	40		20				40
West	Carbaryl_OrnamentalDust	14	13	17	14	10	17	13
West	Carbaryl_OrnamentalHES	33	11		17	11	11	17
West	Carbaryl_OrnamentalRTU	29	14		43	14		
West	Carbaryl_PetCollar			11	11	22	22	33
West	Carbaryl_TreeHES	35	18		12	12	6	18
US Total	Carbaryl_GardenDust	12	13	17	15	15	12	16
US Total	Carbaryl_GardenHES	8	17	13	17	11	12	22
US Total	Carbaryl_GardenRTU	10	10	13	19	15	17	17
US Total	Carbaryl_LawnDust	23	13	6	11	10	24	13
US Total	Carbaryl_LawnGPS	22	33		11	22	11	
US Total	Carbaryl_LawnHES	17	10	17	10	8	15	23
US Total	Carbaryl_OrnamentalDust	17	13	12	14	14	13	17
US Total	Carbaryl_OrnamentalHES	13	11	13	13	13	14	23
US Total	Carbaryl_OrnamentalRTU	12	17	10	17	12	17	16
US Total	Carbaryl_PetCollar	15	11	4	23	13	11	23
US Total	Carbaryl_TreeHES	12	12	14	14	14	15	18
US Total	Propoxur_PetCollar	18	9	9	9	9	27	18

Table II.D.1-11: Distribution of All Applications, by Month

Scenario	REGION	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Carbaryl_GardenDust	East	0	0	0	0	5	13	6	4	1	0	0	0	29
Carbaryl_GardenDust	Midwest	0	0	0	0	25	37	39	17	9	3	0	0	130
Carbaryl_GardenDust	South	0	1	0	6	64	47	37	18	7	1	1	2	184
Carbaryl_GardenDust	West	1	0	0	2	24	16	13	8	8	2	0	0	74
Carbaryl_GardenDust	Total	1	1	0	8	118	113	95	47	25	6	1	2	417
Carbaryl_GardenDust	Total-Pct	0.2%	0.2%	0%	2%	28%	27%	23%	11%	6%	1%	0.2%	0.5%	100%
Carbaryl_GardenHES	East	0	0	0	0	3	15	17	7	2	0	0	0	44
Carbaryl_GardenHES	Midwest	0	0	0	0	5	6	5	3	0	0	0	0	19
Carbaryl_GardenHES	South	0	0	0	2	20	18	20	7	4	1	0	0	72
Carbaryl_GardenHES	West	0	0	0	0	2	3	1	3	1	0	0	0	10
Carbaryl_GardenHES	Total	0	0	0	2	30	42	43	20	7	1	0	0	145
Carbaryl_GardenHES	Total-Pct	0%	0%	0%	1%	21%	29%	30%	14%	5%	1%	0%	0%	100%
Carbaryl_GardenRTU	East	0	0	0	0	1	2	2	0	2	0	0	0	7
Carbaryl_GardenRTU	Midwest	0	0	0	0	0	2	5	0	1	0	0	0	8
Carbaryl_GardenRTU	South	0	0	0	2	6	12	9	2	0	0	0	0	31
Carbaryl_GardenRTU	West	0	0	0	0	1	1	0	0	0	0	0	0	2
Carbaryl_GardenRTU	Total	0	0	0	2	8	17	16	2	3	0	0	0	48
Carbaryl_GardenRTU	Total-Pct	0%	0%	0%	4%	17%	35%	33%	4%	6%	0%	0%	0%	100%
Carbaryl_LawnDust	East	0	0	0	0	1	0	1	1	0	0	0	0	3
Carbaryl_LawnDust	Midwest	0	0	0	0	0	3	0	0	0	0	0	0	3
Carbaryl_LawnDust	South	1	1	6	9	8	3	2	5	6	3	4	3	51
Carbaryl_LawnDust	South	2%	2%	12%	17%	16%	6%	4%	10%	12%	6%	8%	6%	100%
Carbaryl_LawnDust	West	0	0	0	0	2	3	0	0	0	0	0	0	5
Carbaryl_LawnDust	Total	1	1	6	9	11	9	3	6	6	3	4	3	62
Carbaryl_LawnDust	Total-Pct	2%	2%	10%	15%	18%	15%	5%	10%	10%	5%	6%	5%	100%
Carbaryl_LawnGPS	East	0	0	0	0	0	0	1	0	0	0	0	0	1
Carbaryl_LawnGPS	Midwest	0	0	0	2	0	0	0	0	1	0	0	0	3
Carbaryl_LawnGPS	South	1	0	0	0	0	0	0	0	0	1	0	0	2
Carbaryl_LawnGPS	West	0	0	0	0	1	1	0	0	0	1	0	0	3
Carbaryl_LawnGPS	Total	1	0	0	2	1	1	1	0	1	2	0	0	9
Carbaryl_LawnGPS	Total-Pct	11%	0%	0%	22%	11%	11%	11%	0%	11%	22%	0%	0%	100%
Carbaryl_LawnHES	East	0	0	0	0	1	5	2	1	0	1	0	0	10
Carbaryl_LawnHES	Midwest	0	0	0	1	2	4	4	5	0	0	0	0	16
Carbaryl_LawnHES	South	0	0	1	2	8	1	4	3	0	1	1	0	21
Carbaryl_LawnHES	West	0	0	0	0	0	2	1	1	0	1	0	0	5
Carbaryl_LawnHES	Total	0	0	1	3	11	12	11	10	0	3	1	0	52

Scenario	REGION	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Carbaryl_LawnHES	Total-Pct	0%	0%	2%	6%	21%	23%	21%	19%	0%	6%	2%	0%	100%
Carbaryl_OrnamentalDust	East	0	0	0	0	8	7	4	2	2	0	0	0	23
Carbaryl_OrnamentalDust	Midwest	0	0	0	1	19	29	29	14	4	2	0	0	98
Carbaryl_OrnamentalDust	South	1	0	4	1	66	27	27	19	6	3	0	1	155
Carbaryl_OrnamentalDust	West	1	2	3	6	22	9	10	9	4	1	1	1	69
Carbaryl_OrnamentalDust	Total	2	2	7	8	115	72	70	44	16	6	1	2	345
Carbaryl_OrnamentalDust	Total-Pct	1%	1%	2%	2%	33%	21%	20%	13%	5%	2%	0%	1%	100%
Carbaryl_OrnamentalHES	East	0	0	0	1	3	5	5	3	1	1	0	0	19
Carbaryl_OrnamentalHES	Midwest	0	0	0	0	8	3	14	5	0	0	0	0	30
Carbaryl_OrnamentalHES	South	0	1	1	2	15	13	9	3	4	0	0	0	48
Carbaryl_OrnamentalHES	West	0	0	0	0	0	9	6	2	1	0	0	0	18
Carbaryl_OrnamentalHES	Total	0	1	1	3	26	30	34	13	6	1	0	0	115
Carbaryl_OrnamentalHES	Total-Pct	0%	1%	1%	3%	23%	26%	30%	11%	5%	1%	0%	0%	100%
Carbaryl_OrnamentalRTU	East	0	0	0	0	1	6	1	5	0	1	0	0	14
Carbaryl_OrnamentalRTU	Midwest	0	0	0	0	0	2	3	4	1	0	0	0	10
Carbaryl_OrnamentalRTU	South	0	0	0	2	9	14	17	10	4	2	1	0	59
Carbaryl_OrnamentalRTU	West	0	0	0	0	4	1	1	0	1	0	0	0	7
Carbaryl_OrnamentalRTU	Total	0	0	0	2	14	23	22	19	6	3	1	0	90
Carbaryl_OrnamentalRTU	Total-Pct	0%	0%	0%	2%	16%	26%	24%	21%	7%	3%	1%	0%	100%
Carbaryl_PetCollar	East	0	0	0	0	0	1	0	0	0	0	0	0	1
Carbaryl_PetCollar	Midwest	0	0	0	0	4	1	2	0	0	0	0	0	7
Carbaryl_PetCollar	South	0	0	0	2	10	9	3	3	1	2	0	0	30
Carbaryl_PetCollar	South	0%	0%	0%	7%	33%	30%	10%	10%	3%	7%	0%	0%	100%
Carbaryl_PetCollar	West	0	1	1	1	2	0	0	1	0	3	0	0	9
Carbaryl_PetCollar	Total	0	1	1	3	16	11	5	4	1	5	0	0	47
Carbaryl_PetCollar	Total-Pct	0%	2%	2%	6%	34%	23%	11%	9%	2%	11%	0%	0%	100%
Carbaryl_TreeHES	East	0	0	0	2	11	10	13	7	2	1	0	0	46
Carbaryl_TreeHES	Midwest	0	0	0	3	9	12	12	4	2	2	0	0	44
Carbaryl_TreeHES	South	0	0	0	8	23	19	15	5	4	0	0	0	74
Carbaryl_TreeHES	West	0	0	0	1	6	2	2	3	1	0	2	0	17
Carbaryl_TreeHES	Total	0	0	0	14	49	43	42	19	9	3	2	0	181
Carbaryl_TreeHES	Total-Pct	0%	0%	0%	8%	27%	24%	23%	10%	5%	2%	1%	0%	100%
Propoxur_PetCollar	East	0	0	0	0	1	4	2	2	1	1	0	0	11
Propoxur_PetCollar	Total	0	0	0	0	1	4	2	2	1	1	0	0	11
Propoxur_PetCollar	Total-Pct	0%	0%	0%	0%	9%	36%	18%	18%	9%	9%	0%	0%	100%

Table II.D.1-12: Calendex Links to Account for Co-occurrence Use Across Scenarios[1]

Index	Scenario_NMC	Baseline Assumptions		Alternative Assumption	
		Link Type		Link Type	Link Percent
1	Carbaryl_LawnDust				
2	Carbaryl_GardenDust			4	25%
3	Carbaryl_OrnamentalDust			4	25%
4	Carbaryl_LawnHES				
5	Carbaryl_GardenHES			4	25%
6	Carbaryl_OrnamentalHES			4	25%
7	Carbaryl_TreeHES			4	25%
8	Carbaryl_LawnGPS				
9	Carbaryl_GardenRTU				
10	Carbaryl_OrnamentalRTU			4	25%
11	Methiocarb_OrnamentalDust				
12	Carbaryl_PetCollar	A		A	
13	Propoxur_PetCollar	A		A	

1 Co-occurrence across scenarios was not incorporated into the current assessment.

Table II.D.1-13a: Total Applications on a Given Date, By Site

Total Number of Applications	Garden	Ornamental	Lawn	Pet	Tree	Lawn_LCO	Diag
Garden	297	69	6	4	26	4	297
Ornamental	69	271	28	1	27	2	271
Lawn	6	28	78	0	7	1	78
Pet	4	1	0	33	1	0	33
Tree	26	27	7	1	82	0	82
Lawn_LCO	4	2	1	0	0	15	15
Null	297	271	78	33	82	15	

Scenario_NMC	Garden	Ornamental	Lawn	Pet	Tree	Lawn_LCO
Garden	1.00	0.23	0.02	0.01	0.09	0.01
Ornamental	0.25	1.00	0.10	0.00	0.10	0.01
Lawn	0.08	0.36	1.00	0.00	0.09	0.01
Pet	0.12	0.03	0.00	1.00	0.03	0.00
Tree	0.32	0.33	0.09	0.01	1.00	0.00
Lawn_LCO	0.27	0.13	0.07	0.00	0.00	1.00

Table II.D.1-14: Total Number of Application-Events, By Scenario_NMC

Scenario_NMC	Carbaryl_GardenDust	Carbaryl_GardenHES	Carbaryl_GardenRTU	Carbaryl_LawnDust	Carbaryl_LawnGPS	Carbaryl_LawnHES	Carbaryl_OrnamentalDust	Carbaryl_OrnamentalHES	Carbaryl_OrnamentalRTU	Carbaryl_PetCollar	Carbaryl_TreeHES	Propoxur_PetCollar	Carbaryl_LawnHES_LCO	Methiocarb_OrnamentalDust	Diag
Carbaryl_GardenDust	204	0	0	4	0	0	45	1	0	3	6	0	3	0	204
Carbaryl_GardenHES	0	69	0	0	0	2	0	17	0	0	14	0	1	1	69
Carbaryl_GardenRTU	0	0	24	0	0	0	0	0	6	1	6	0	0	0	24
Carbaryl_LawnDust	4	0	0	45	0	0	8	0	0	0	2	0	0	0	45
Carbaryl_LawnGPS	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
Carbaryl_LawnHES	0	2	0	0	0	31	0	18	2	0	5	0	1	0	31
Carbaryl_OrnamentalDust	45	0	0	8	0	0	157	1	0	1	5	0	2	2	157
Carbaryl_OrnamentalHES	1	17	0	0	0	18	1	66	0	0	19	0	0	0	66
Carbaryl_OrnamentalRTU	0	0	6	0	0	2	0	0	43	0	3	0	0	0	43
Carbaryl_PetCollar	3	0	1	0	0	0	1	0	0	24	1	0	0	0	24
Carbaryl_TreeHES	6	14	6	2	0	5	5	19	3	1	82	0	0	0	82
Propoxur_PetCollar	0	0	0	0	0	0	0	0	0	0	0	9	0	0	9
Carbaryl_LawnHES_LCO	3	1	0	0	0	1	2	0	0	0	0	0	15	0	15
Methiocarb_OrnamentalDust	0	1	0	0	0	0	2	0	0	0	0	0	0	8	8

Table II.E.1-14.b Co-occurrence Matrix, By Scenario_NMC

Scenario_NMC	Carbaryl_GardenDust	Carbaryl_GardenHES	Carbaryl_GardenRTU	Carbaryl_LawnDust	Carbaryl_LawnGPS	Carbaryl_LawnHES	Carbaryl_OrnamentalDust	Carbaryl_OrnamentalHES	Carbaryl_OrnamentalRTU	Carbaryl_PetCollar	Carbaryl_TreeHES	Propoxur_PetCollar	Carbaryl_LawnHES_LCO	Methiocarb_OrnamentalDust
Carbaryl_GardenDust	1.00	0.00	0.00	0.02	0.00	0.00	0.22	0.00	0.00	0.01	0.03	0.00	0.01	0.00
Carbaryl_GardenHES	0.00	1.00	0.00	0.00	0.00	0.03	0.00	0.25	0.00	0.00	0.20	0.00	0.01	0.01
Carbaryl_GardenRTU	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.25	0.04	0.25	0.00	0.00	0.00
Carbaryl_LawnDust	0.09	0.00	0.00	1.00	0.00	0.00	0.18	0.00	0.00	0.00	0.04	0.00	0.00	0.00
Carbaryl_LawnGPS	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carbaryl_LawnHES	0.00	0.06	0.00	0.00	0.00	1.00	0.00	0.58	0.06	0.00	0.16	0.00	0.03	0.00
Carbaryl_OrnamentalDust	0.29	0.00	0.00	0.05	0.00	0.00	1.00	0.01	0.00	0.01	0.03	0.00	0.01	0.01
Carbaryl_OrnamentalHES	0.02	0.26	0.00	0.00	0.00	0.27	0.02	1.00	0.00	0.00	0.29	0.00	0.00	0.00
Carbaryl_OrnamentalRTU	0.00	0.00	0.14	0.00	0.00	0.05	0.00	0.00	1.00	0.00	0.07	0.00	0.00	0.00
Carbaryl_PetCollar	0.13	0.00	0.04	0.00	0.00	0.00	0.04	0.00	0.00	1.00	0.04	0.00	0.00	0.00
Carbaryl_TreeHES	0.07	0.17	0.07	0.02	0.00	0.06	0.06	0.23	0.04	0.01	1.00	0.00	0.00	0.00
Propoxur_PetCollar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
Carbaryl_LawnHES_LCO	0.20	0.07	0.00	0.00	0.00	0.07	0.13	0.00	0.00	0.00	0.00	0.00	1.00	0.00
Methiocarb_OrnamentalDust	0.00	0.13	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	1.00

Table II.D.1-15 Lifeline Target Pests Use Factors

Chemical/Site	Carbaryl	Carbaryl	Carbaryl	Carbaryl	Propoxur	Methiocarb
PESTNAME	Lawn	Garden	Orn / Tree	Pet	Pet	Orn / Tree
ANY OTHER ANTS	1.2%	23.9%	6.7%		29.6%	
BEES, HORNETS, WASPS	2.3%				9.6%	
BROADLEAF WEEDS		8.7%	5.0%			
COCKROACHES					14.4%	
FABRIC INSECT PESTS						
FIRE ANTS	3.1%	34.4%	15.3%			
FLEAS	6.7%	63.7%	24.7%	6.5%	1.8%	
FLIES, GNATS, WIDGETS				2.8%	2.3%	
GRASS-LIKE WEEDS		16.4%	5.4%			
MICE, RATS						
MILDEW, MOLD, BACTERIS, VIRUS			3.9%		1.4%	
MOSQUITOES				1.8%		
OTHER MAMMALS		50.1%				
OTHER PEST				7.0%		
OTHER WOOD-DESTROYING INSECTS		24.6%	13.6%			
PLANT DISEASES	5.5%	7.3%	8.0%			
PLANT-CHEWING INSECTS	8.6%	24.3%	19.6%	100%		
PLANT-CHEWING OR PLANT SUCKING INSECTS	4.8%	32.4%	8.4%	75.2%		
PLANT-SUCKING INSECTS AND MITES	6.7%	18.8%	11.3%	34.7%	17.2%	
SLUGS, SNAILS	13.4%	9.2%	15.8%			4.6%
SOIL-DWELLING INSECTS, NEMATODES	1.3%	13.1%	13.8%			
SPIDERS, CRICKETS, SOWBUGS/PILLBUGS, MILLIPIDES, CENTIPIDES	4.1%	29.3%	6.5%		6.5%	
STORED FOOD INSECT PESTS						
TERMITES						
TICKS, CHIGGERS	5.5%			8.1%	1.9%	

Table II.D.1-16 Estimated Carbaryl Usage on Golf Courses

Statistic	National	Northeast	South	West	Midwest
Percent of Golf Courses Using Carbaryl	10% - 15%	10% - 15%	15% - 25%	1% - 5%	5% - 15%
Pounds of Carbaryl Applied	90,000 lbs – 280,000 lbs	15,000 lbs – 30,000 lbs	50,000 lbs – 225,000 lbs	<500 lbs – 5,000 lbs	15,000 lbs – 75,000 lbs

/1 Three year average based on EPA proprietary data (1998, 1999, 2001).

Table II.**D.**.1-1 presents the estimated percent of golf courses that applied carbaryl. As the table indicates, golf courses in the Southern states account for most of the estimated total use of carbaryl - many as 25% of all golf courses in the South applied between 50,000 lbs ai and 225,000 lbs ai of carbaryl per year.

Residential Appendix D-2

1. Residential Exposure Scenarios Appendix

The NMC CRA considered a variety of exposure scenarios for consumer applicator and post-application residential exposures. The data from multiple studies that measured various exposure values have been used in the residential portion of the residential risk assessment. In some cases, statistical distributions have been fitted to the datasets. For such datasets, exposure estimates were based on the fitted distributions. Brief descriptions of the studies and statistical details of the datasets used in the residential portion of the risk assessment are provided below.

2. Lawn Care Exposure Scenarios

Unit Exposure Data

Study Summaries

MRID 44972201 (ORETF Turf Handler Studies): A report was submitted by the ORETF (Outdoor Residential Exposure Task Force) that presented data in which the application of various products used on turf by homeowners and lawncare operators (LCOs) was monitored. All of the data submitted in this report were completed in a series of studies. The two studies that monitored homeowner exposure using a granular spreader (ORETF Study OMA003) and a hose-end sprayer (ORETF Study OMA004) are summarized below.

OMA003: A total of 30 volunteer test subjects were monitored using passive dosimetry (inner and outer whole body dosimeters, hand washes, face/neck wipes, and personal inhalation monitors). Each test subject carried, loaded, and applied two 25-lb bags of fertilizer (0.89% active ingredient) with a rotary type spreader to a lawn (a turf farm in North Carolina) covering 10,000 ft^2 (one bag to each of the two 5000 ft^2 test plots). Application to each subplot continued until the hopper was empty. Each participant also disposed of the empty bags at the end of the replicate. The target application rate was 2 lb ai/acre (actual rate achieved was about 1.9 lb ai/acre). The average application time was 22 minutes, including loading the rotary push spreader and disposing of the empty bags. Approximately 0.45 lb ai was handled in each replicate. Dermal exposure was measured using inner and outer whole body dosimeters, hand washes, face/neck washes, and personal air monitoring devices with OVS tubes. Overall, residues were highest on the upper and lower leg portions of the dosimeters.

OMA004: Dermal and inhalation exposures were estimated using passive dosimetry techniques (biological monitoring data were not collected). A total of

60 replicates were monitored using 30 test subjects (two replicates each) during applications to residential lawns in Frederick, Maryland. Thirty applicator replicates were monitored using a ready-to-use (RTU) product (Bug-B-Gon) packaged in a 32 fl. oz. screw-on container. These containers were attached to garden hose-ends. An additional 30 mixer/loader/applicator replicates were monitored using Diazinon Plus also packaged in 32 fl. oz. plastic bottles. This product required the test subjects to pour the product into dial-type sprayers (DTS) that were attached to garden hose-ends.

A nominal application rate of 4 lb ai/acre was used for all replicates. Each replicate monitored the test subject treating 5,000 ft^2 of turf and handling a total of 0.5 lb ai/replicate. The average time per replicate was 75 minutes. Dermal and inhalation exposure were measured using inner and outer whole body dosimeters (long pants and long sleeved shirt over long underwear), hand washes, face/neck washes, and personal air monitoring devices.

Statistical Details

Distributional parameters were estimated for the dermal and inhalation unit exposure (UE) values for the granular (Table II.D.2-1), and liquid sprayable (Table II.D.2-2) formulations of carbaryl. All dermal and inhalation UE values represent milligrams exposure per pound of active ingredient of a pesticide handled. All UEs were assumed to be lognormally distributed (i.e. fitted with a lognormal distribution). For each dataset, the shape (α) and scale (β) lognormal parameters were estimated by calculating the mean and standard deviation of the natural logarithms (base *e*) of the UEs. Parametric estimates of the arithmetic mean (μ) and standard deviation (σ) of the lognormal distribution were then calculated based on the shape and scale parameter estimates. The formulae used to calculate the mean and standard deviation are given below.

$$\mu = \exp(\alpha + \tfrac{1}{2}\beta^2)$$

$$\sigma = \mu\sqrt{\exp(\beta^2) - 1}$$

Shapiro-Wilk (S-W) normality test statistics were used to assess the lognormal assumption implicit in the parametric calculations of the mean and standard deviation. The means, standard deviations, and p-values of the S-W statistics are provided in Table II.D.2-3. A small p-value indicates that logarithms of the UEs are not normally distributed, or equivalently, that the UEs are not lognormally distributed. Both the granular inhalation UE and dust inhalation UE datasets resulted in S-W statistics with p-values less than 0.05.

Table II.D.2-1 Granular Rotary Spreader UE Data (OMA003) Used for Lawn Care Scenario

Dermal UE Values (mg/lb ai)	Inhalation UE Values (mg/lb ai)
0.529	0.0001
0.392	0.0008
0.668	0.0011
0.692	0.0027
0.329	0.0001
0.373	0.0007
0.363	0.0007
0.595	0.0014
0.339	0.0007
0.563	0.0014
0.712	0.0026
0.253	0.0006
0.787	0.0035
0.514	0.0033
0.999	0.0015
0.412	0.0008
0.427	0.0007
0.917	0.0011
0.757	0.0010
0.827	0.0008
0.620	0.0006
0.730	0.0003
0.551	0.0006
2.104	0.0011
1.363	0.0032
0.915	0.0025
0.522	0.0007
6.980	0.0008
0.462	0.0007
1.022	0.0003

Table II.D.2-2 Hose End Sprayer on Turf UE Data (OMA004) Used for Lawn Care Scenarios

Dermal UE Values (mg/lb ai)	Inhalation UE Values (mg/lb ai)
0.21	0.019
6.76	0.026
32.61	0.065
1.84	0.013
3.09	0.030
3.16	0.037
1.22	0.027
1.36	0.030

1.29	0.003
0.99	0.019
9.38	0.034
1.16	0.006
3.20	0.021
9.69	0.045
5.42	0.061
12.89	0.005
1.92	0.002
8.93	0.004
3.68	0.017
11.05	0.008
0.08	0.001
23.03	0.001
4.51	0.003
0.22	0.015
2.83	0.029
1.20	0.003
8.60	0.007
0.41	0.003
23.66	0.014
0.17	0.004

Table II.D.2-3 Lognormal Distributions of UEs Used for Lawn Care Scenarios

Application Method	Exposure Route	Unit Exposure Distribution (mg/lb ai)	Shapiro-Wilk p-value
Granular Rotary Spreader	Dermal	LN(0.809, 0.570)	0.0011
	Inhalation	LN(0.0013, 0.0013)	0.0511
Hose End Sprayer (RTU) on Turf	Dermal	LN(8.44, 26.2)	0.3630
	Inhalation	LN(0.022, 0.040)	0.1890

NOTES:

LN(,) represents a lognormal distribution with mean= and standard deviation= .

For lawn scenarios, information was derived from chemical-specific data and studies conducted by the ORETF (Outdoor Residential Exposure Task).

Additionally, probability plots were used to qualitatively assess the appropriateness of the lognormal assumptions. Generally a probability plot displays the actual values of a dataset (represented as points) and their expected values (represented as a line) for the specified distribution. The closer the actual values are to their expected values (i.e. the more the actual values approximate a straight line), the more likely the dataset is of the specified distribution. The probability plots for the UE datasets are provided in Figures II.D.2-1 through 4. For the granular dermal UE dataset, the probability plot indicates that the small S-W p-value is due to one very high value; whereas for the dust inhalation UE dataset, one very low value results in a small S-W p-value. The other datasets are reasonably approximated by lognormal distributions.

Figure II.D.2-1 Lognormal Probability Plot of Granular Rotary Spreader Dermal UE Data (OMA003)

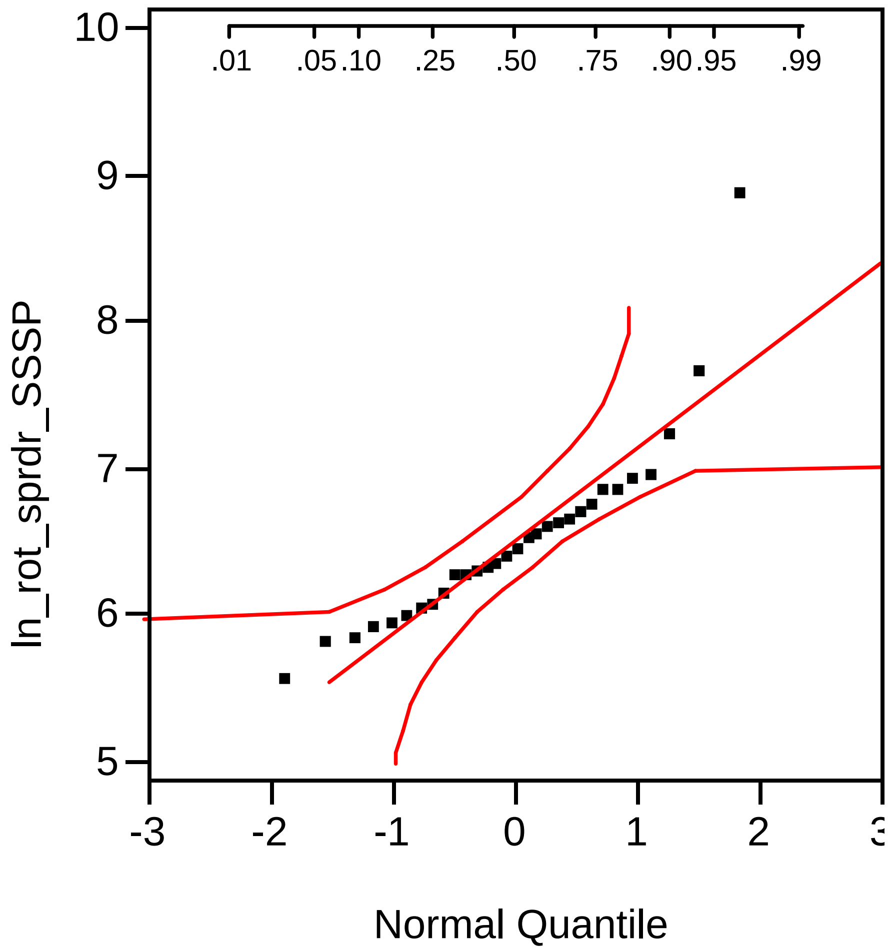


Figure II.D.2-Error! No text of specified style in document.**2 Lognormal Probability Plot of Granular Rotary Spreader Inhalation UE Data (OMA003)**

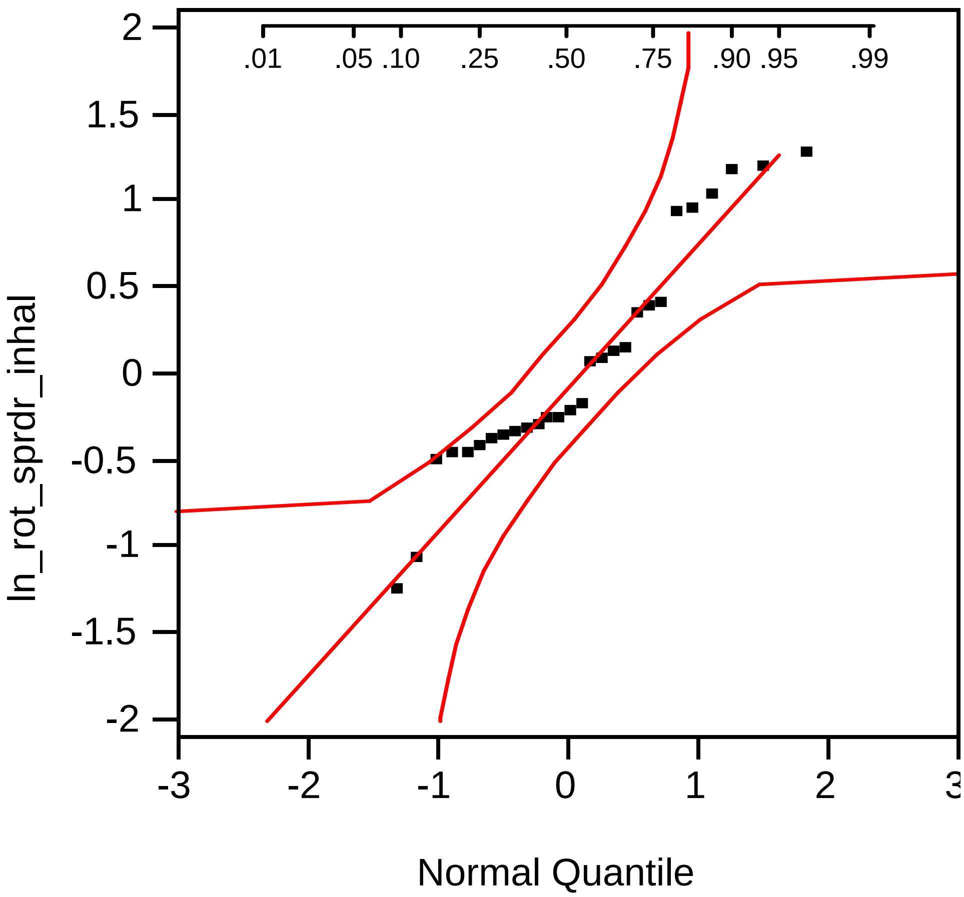


Figure II.D.2-D-3 Lognormal Probability Plot of HES Sprayer on Turf Dermal UE Data (OMA004)

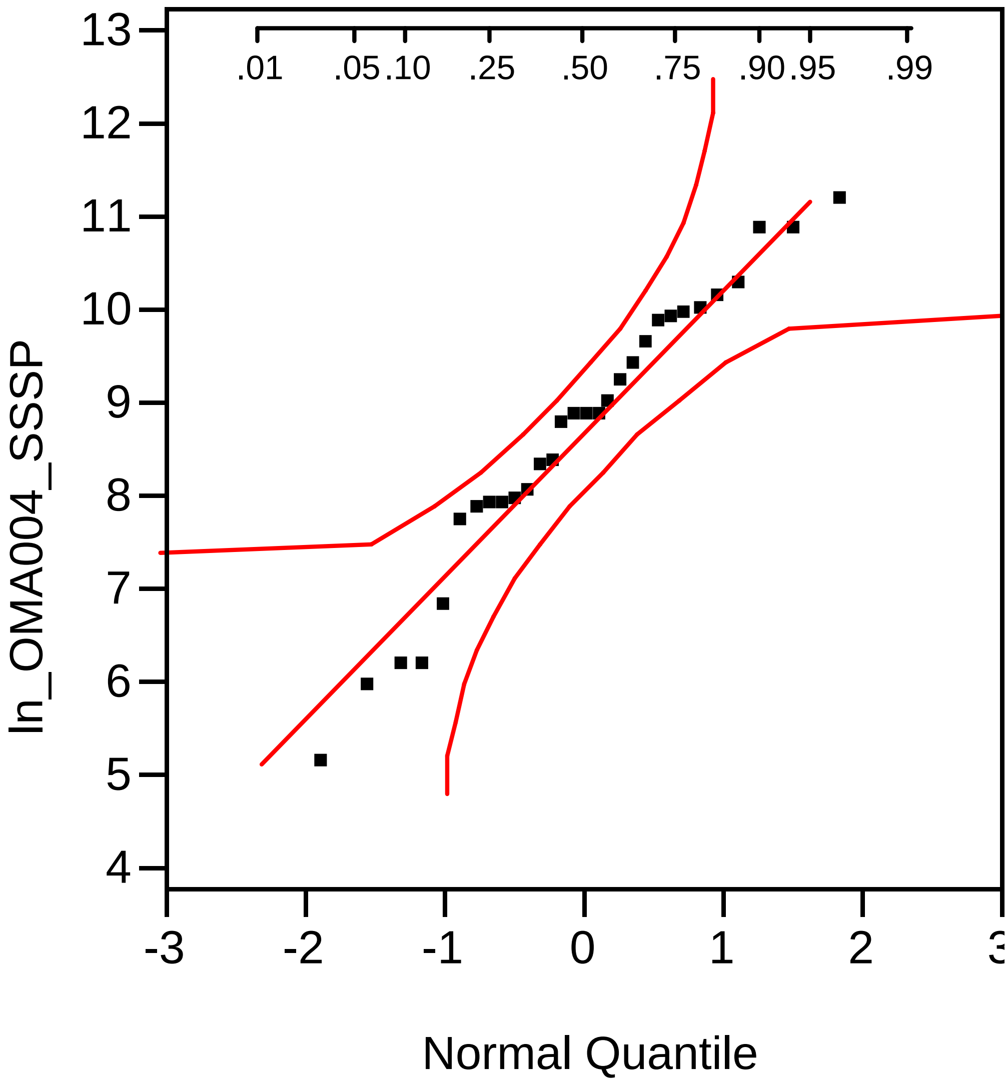
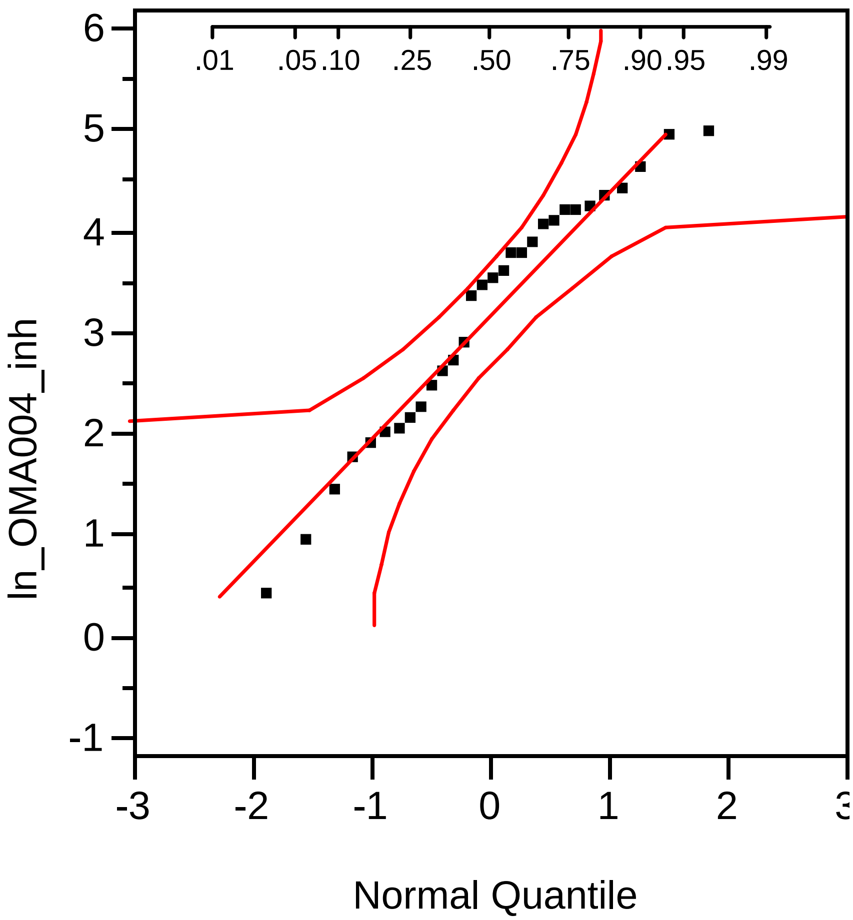


Figure II.D.2-4 Lognormal Probability Plot of Hose End Sprayer on Turf Inhalation UE Data (OMA004)



Residue Data

Study Summaries

MRID 46673901 (Carbaryl Granular (Sevin 2G) Turf Transferable Residue Study):

This study was designed to determine transferable residues of carbaryl from both irrigated and non-irrigated turf treated with SEVIN® 2G at a target application rate of 9 lb formulated product/1000ft^2 (0.18 lb ai/1000ft^2), equating to or 392 lb formulated product per acre (7.84 lb ai/A). The field trials were conducted at three locations: Molino, FL (EPA Region 3), Stilwell, KS (EPA Region 5), and Fresno, CA (EPA Region 10). SEVIN™ 2G, formulated as wettable granules containing 2.0% active ingredient (ai) carbaryl, was applied once to each plot using a drop spreader. Transferable residues were measured using the modified California roller method for turf transferable residues (TTR). Triplicate TTR samples were collected prior to application, immediately after application, 4 hours after, 10 hours after, and 1, 2, 3, 5 and 7 days after treatment (DAT). Irrigation water (i.e., between 0.30 and 0.50 inches) was applied immediately after application was complete to the appropriate sites.

Natural rainfall also occurred at the Kansas and Florida sites, none was observed in California. In Kansas, the first rainfall (0.35 inches) occurred prior to the 24 hour sample and 3.46 inches total occurred over the entire study. In Florida, the first rainfall (0.16 inches) occurred prior to the 3 day sample and 2.48 inches total occurred over the entire study.

Statistical Details

Turf transferable residues (TTR) values are assumed to degrade exponentially over time (i.e. degrade by a constant proportion for any given time interval). In order to estimate the initial TTR value (i.e. TTR value at day zero) and the half-life of the granular formulation of carbaryl, the natural logarithms of the 24(3 samples X 9 days) individual TTR samples (Table II.D.2-4) from the Florida site were linearly regressed on the day of sample collection. The form of the linear regression is given below.

$$\ln(y) = \beta_0 + \beta_1 t$$

The linear regression parameters were then used to calculate initial DFR value (**A_0**) and the half-life (**$T_{1/2}$**) using formulae given below.

$$A_0 = \exp(\beta_0)$$

$$T_{1/2} = -\frac{\ln(2)}{\beta_1}$$

Table II.D.2-4 Granular Formulation TTR Data (MRID # 451143-01, Florida site (non-irrigated plot)) Used for Lawn Care Scenario

Day	TTR Values (mg/cm^2)
0	0.0003949
	0.0001819
	0.0011007
0.167	0.0000727
	0.0000438
	0.0000650
0.5	0.0002638
	0.0001719
	0.0003815
1	0.0000621
	0.0000513

	0.0001096
2	0.0000671
	0.0000424
	0.0001404
3	0.0000204
	0.0000197
	0.0000185
5	0.0000008
	0.0000010
	0.0000010
7	0.0000054
	0.0000014
	0.0000003

Transfer Coefficient Data

Study Summaries

Vaccaro, 1996: In the Vaccaro 1996 study, a granular formulation of chlorpyrifos was applied, after which seven adults performed pre-choreographed activities intended to mimic a typical child's behavior. The subjects performed these activities for a period of four hours beginning after the turf had dried. Turf had been treated earlier with a granular form of chlorpyrifos and exposure was estimated in the study by monitoring the amount of a chlorpyrifos metabolite – 3,4,5, 6-TCP – excreted over the following period of 6 days. This method directly measures internal dose and was used to back-calculate a generic "to the skin" transfer coefficient by using chemical specific dermal absorption data for chlorpyrifos (Nolan et al., 1984)

Statistical Details

Distributional parameters were estimated for the adult transfer coefficient (TC) values from the Vaccaro (1996) granular study (Table II.D.2-5). All TC values were expressed as square centimeters per hour (cm^2/hr). Adult TCs were assumed to be lognormally distributed (i.e. fitted with a lognormal distribution). The shape (α) and scale (β) lognormal parameters were estimated by calculating the mean and standard deviation of the natural logarithms (base *e*) of the TCs. Parametric estimates of the arithmetic mean (μ) and standard deviation (σ) of the lognormal distribution were then calculated based on the shape and scale parameter estimates. The formulae used to calculate the mean and standard deviation are given below.

$$\mu = \exp(\alpha + \tfrac{1}{2}\beta^2)$$

$$\sigma = \mu\sqrt{\exp(\beta^2) - 1}$$

A Shapiro-Wilk (S-W) normality test statistic was used to assess the lognormal assumption implicit in the parametric calculations of the mean and standard deviation. The mean, standard deviation, and p-value of the S-W statistics are provided in Table II.D.2-6. A small p-value indicates that logarithms of the TCs are not normally distributed, or equivalently, that the TCs are not lognormally distributed. For the adult TC dataset, the S-W p-values are greater than 0.05.

Table II.D.2-5 Granular Formulation TC Data Used for Lawn Care Scenarios

TC Values (cm^2/hr)
1229
2813
2813
4010
4688
7446
12920

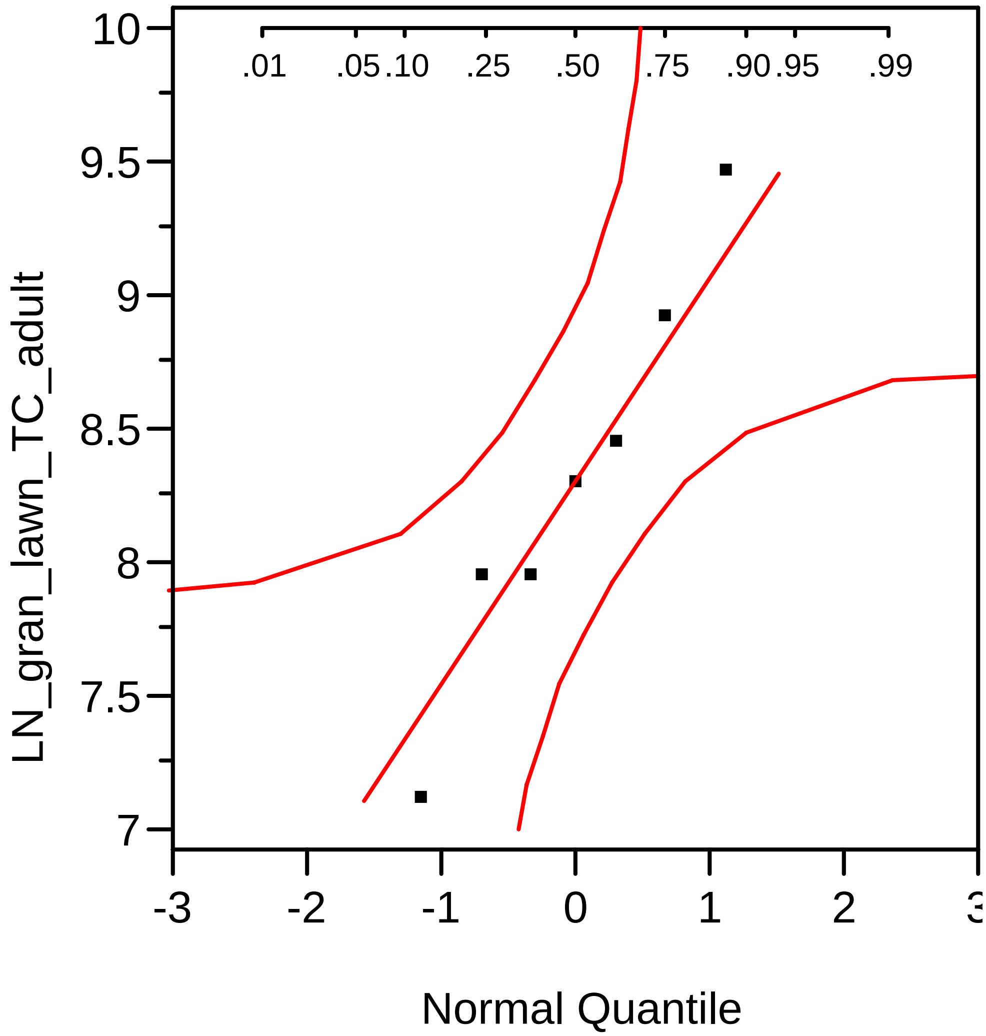
Table II.D.2-6 Lognormal Distributions of TCs Used for Lawn Care Scenarios

Exposure Route	Transfer Coefficient Distribution (cm^2/hr)	Shapiro-Wilk p-value
Dermal	LN(5376, 4717)	0.9629

NOTES:
LN(μ, σ) represents a lognormal distribution with mean=μ and standard deviation=σ.

Additionally, a probability plot was used to qualitatively assess the appropriateness of the lognormal assumption. Generally a probability plot displays the actual values of a dataset (represented as points) and their expected values (represented as a line) for the specified distribution. The closer the actual values are to their expected values (i.e. the more the actual values approximate a straight line), the more likely the dataset is of the specified distribution. The probability plot for the adult TC dataset is provided in Figures II.D.2-5. The probability plot indicates that the adult TC dataset is reasonably approximated by a lognormal distribution.

Figure II.D.2-5 Lognormal Probability Plot of Granular Formulation Adult TC Data



3. Vegetable Garden Exposure Scenarios

Unit Exposure Data

Study Summaries

MRID 44459801 (Carbaryl Applications To Vegetables Gardens): The data collected reflect the dermal and respiratory exposure of homeowners mixing, loading and applying RP-2 Liquid (21%), a Carbaryl end-use product. Applications were made by volunteers to two 18 foot rows of tomatoes and one 18 foot row of cucumber. The only test field was located in Florida. For this study, RP-2 Liquid (21%) exposures were monitored using hose-end sprayers and low-pressure hand wand sprayers. Exposures to Sevin® 10 Dust, using a separate duster device that required transfer from the package and Sevin® Ready To Use Insect Spray (RTU) in a trigger sprayer package were also monitored. Exposure for each spray method/product combination was monitored using 40 handlers (replicates). Of the 40 replicates per spray method/product combination, 20 wore household latex gloves and 20 performed tasks without gloves. The 20 dust product replicates loaded the dusters and applied without gloves only.

Each replicate opened the end-use product, added it to the application implement (except the RTU product), adjusted the setting and applied it to the vegetable rows. After application to the vegetable rows, dosimeters were collected. Inhalation exposure was monitored with personal air sampling pumps with OVS tubes attached to the shirt collar in the breathing zone. Dermal exposure was assessed by extraction of carbaryl from inner and outer 100 percent cotton dosimeters, face/neck wipes, and glove and hand washes. The inner and outer dosimeters were segmented into: lower and upper arms, lower and upper legs, front and back torso.

Dermal exposure was determined by adding the values from the bare hand rinses, face/neck wipes to the outer dosimeter lower legs and lower arms plus the inner dosimeter front and rear torso, upper legs, lower legs, lower arms, and upper arms. This accounts for the residential handlers with barehands wearing short-sleeved shirt and short pants.

Statistical Details

Distributional parameters were estimated for the dermal and inhalation unit exposure (UE) values for dust (Table II.D.2-7), trigger pump sprayer (Table II.D.2-8), and liquid hose-end sprayer (Table II.D.2-9) applications of Carbaryl. All dermal and inhalation UE values represent milligrams exposure per pound of active ingredient of a pesticide handled. All UEs were assumed to be lognormally distributed (i.e. fitted with a lognormal distribution). For each dataset, the shape (α) and scale (β) lognormal parameters were estimated by calculating the mean and standard deviation of the natural logarithms (base *e*) of the UEs. Parametric estimates of the arithmetic mean (μ) and standard deviation (σ) of the lognormal distribution were then calculated based on the shape and scale parameter estimates. The formulae used to calculate the mean and standard deviation are given below.

$$\mu = \exp(\alpha + \tfrac{1}{2}\beta^2)$$

$$\sigma = \mu\sqrt{\exp(\beta^2) - 1}$$

Shapiro-Wilk (S-W) normality test statistics were used to assess the lognormal assumption implicit in the parametric calculations of the mean and standard deviation. The means, standard deviations, and p-values of the S-W statistics are provided in Table II.D.2-10. A small p-value indicates that logarithms of the UEs are not normally distributed, or equivalently, that the UEs are not lognormally distributed. Both the dust inhalation UE and trigger pump inhalation UE datasets resulted in S-W statistics with p-values less than 0.05.

Table II.D.2-7 Dust Shaker/Powder UE Data (MRID 44459801) Used for Vegetable Garden Scenarios

Dermal UE Values (mg/lb ai)	Inhalation UE Values (mg/lb ai)
673	2.27
588	0.60
276	1.38
129	2.23
176	0.30
94	0.61
236	4.87
229	0.01
85	2.11
69	0.38
82	2.14
258	0.66
51	1.99
1388	14.27
40	0.13
280	1.09
43	1.40
36	0.57
219	2.28
59	0.26

Table II.D.2.8 Trigger Pump Sprayer UE Data (MRID 44459801) Used for Vegetable Garden Scenarios

Dermal UE Values (mg/lb ai)	Inhalation UE Values (mg/lb ai)
129	0.275
59	0.255
250	0.104
132	0.168
145	0.180
91	0.032
165	0.180
77	0.200

24	0.033
50	0.032
24	0.033
100	0.086
23	0.032
24	0.110
20	0.035
218	0.032
9	0.032
18	0.032
41	0.032
23	0.032

Table II.D.2-9 Hose End Sprayer UE Data (MRID44459801) for Vegetable Garden Scenarios

Dermal UE Values (mg/lb ai)	Inhalation UE Values (mg/lb ai)
31	0.0022
47	0.0009
21	0.0016
77	0.0028
58	0.0014
76	0.0030
25	0.0032
31	0.0044
19	0.0017
17	0.0013
33	0.0010
84	0.0041
24	0.0023
56	0.0009
8	0.0027
199	0.0044
163	0.0014
11	0.0007
21	0.0044
7	0.0028

Table II.D.2-10 Lognormal Distributions of UEs Used for Vegetable Garden Scenarios

Application Method	Exposure Route	Unit Exposure Distribution (mg/lb ai)	Shapiro-Wilk p-value
Dust Shaker/Powder	Dermal	LN(247, 333)	0.3691
	Inhalation	LN(2.94, 9.54)	0.0354
Trigger Pump Sprayer	Dermal	LN(86, 107)	0.2191
	Inhalation	LN(0.104, 0.137)*	0.0003
Hose-End Sprayer	Dermal	LN(51, 58)	0.8266
	Inhalation	LN(0.0024, 0.0015)	0.2075

NOTES:
LN(μ, σ) represents a lognormal distribution with mean=μ and standard deviation=σ.
*The mean and standard deviation represent MLE-based estimates.

Additionally, probability plots were used to qualitatively assess the appropriateness of the lognormal assumptions. Generally a probability plot displays the actual values of a dataset (represented as points) and their expected values (represented as a line) for the specified distribution. The closer the actual values are to their expected values (i.e. the more the actual values approximate a straight line), the more likely the dataset is of the specified distribution. The probability plots for the UE datasets are provided in Figures II.D6 through 11. For the dust inhalation UE dataset, the probability plot indicates that the small S-W p-value is due to one very low value; whereas for the trigger pump inhalation UE dataset, several low values account for the small S-W p-value. The other datasets are reasonably approximated by lognormal distributions.

Figure II.D.2-6 Lognormal Probability Plot of Dust Shaker/Powder Dermal UE Data (MRID 44459801)

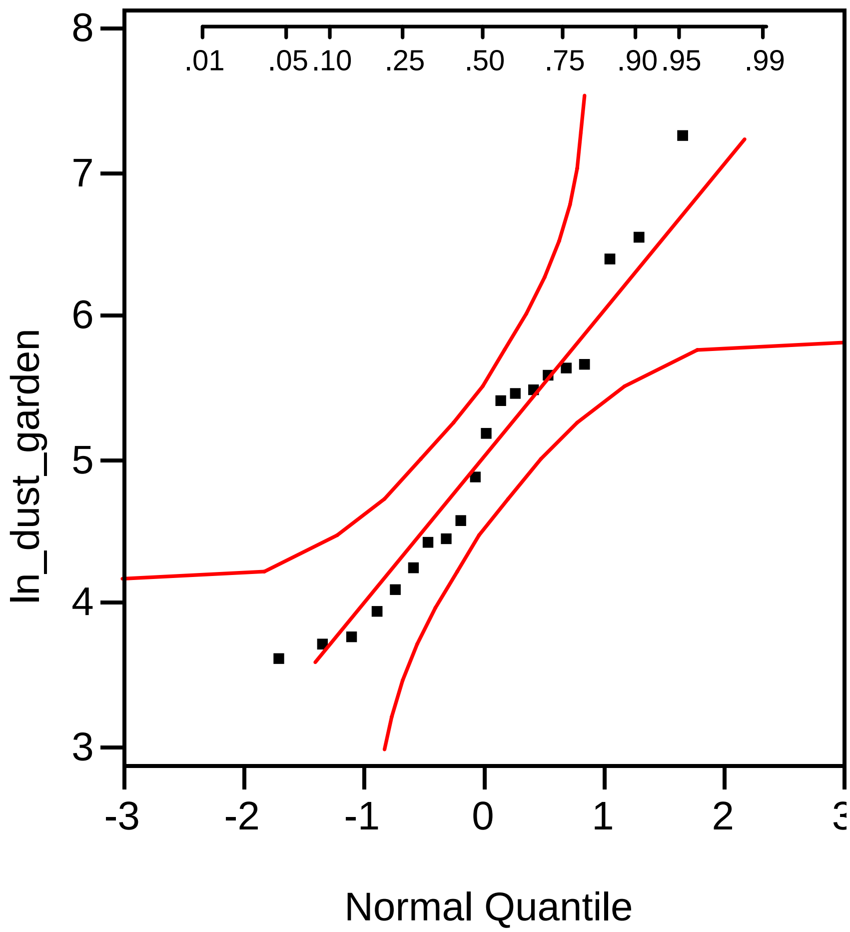
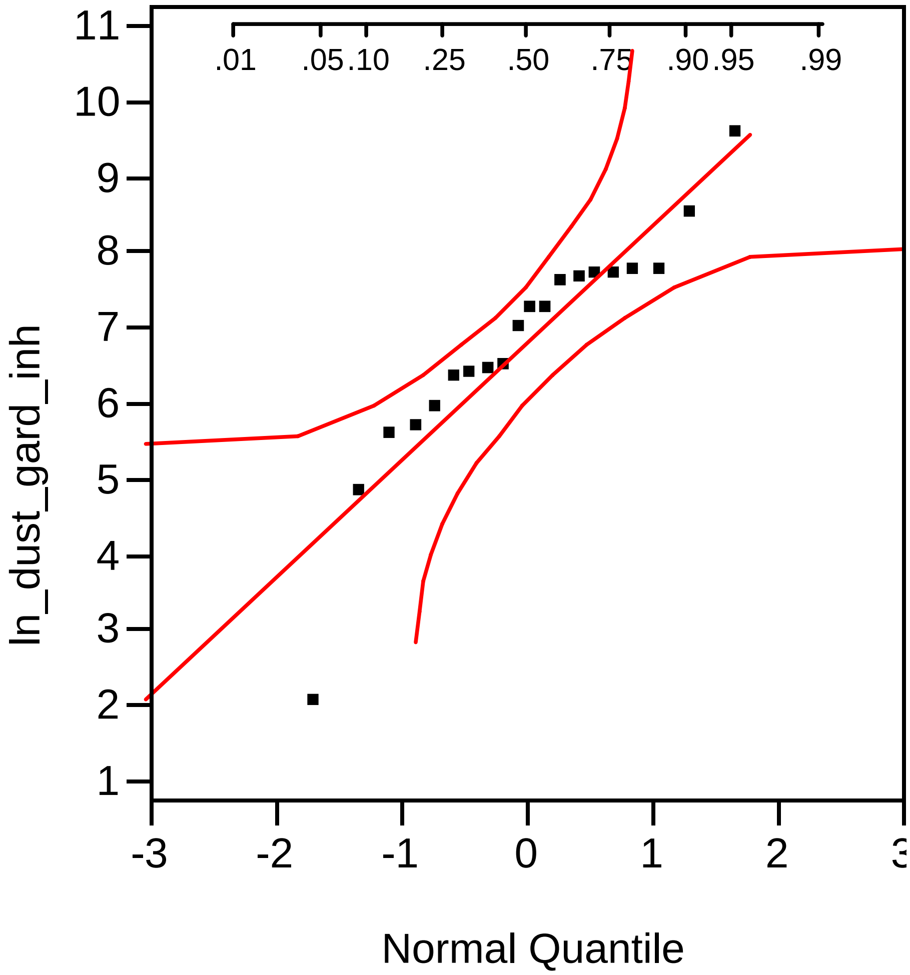


Figure II.D.2-7 Lognormal Probability Plot of Dust Shaker/Powder Inhalation UE Data (MRID 44459801)



ln_dust_gard_inh
Normal Quantile
.01
.05
.10
.25
.50
.75
.90
.95
.99
11
10
9
8
7
6
5
4
3
2
1
-3
-2
-1
0
1
2

Figure II.D.2-8 Lognormal Probability Plot of Trigger Pump Sprayer UE Dermal Data (MRID 44459801)

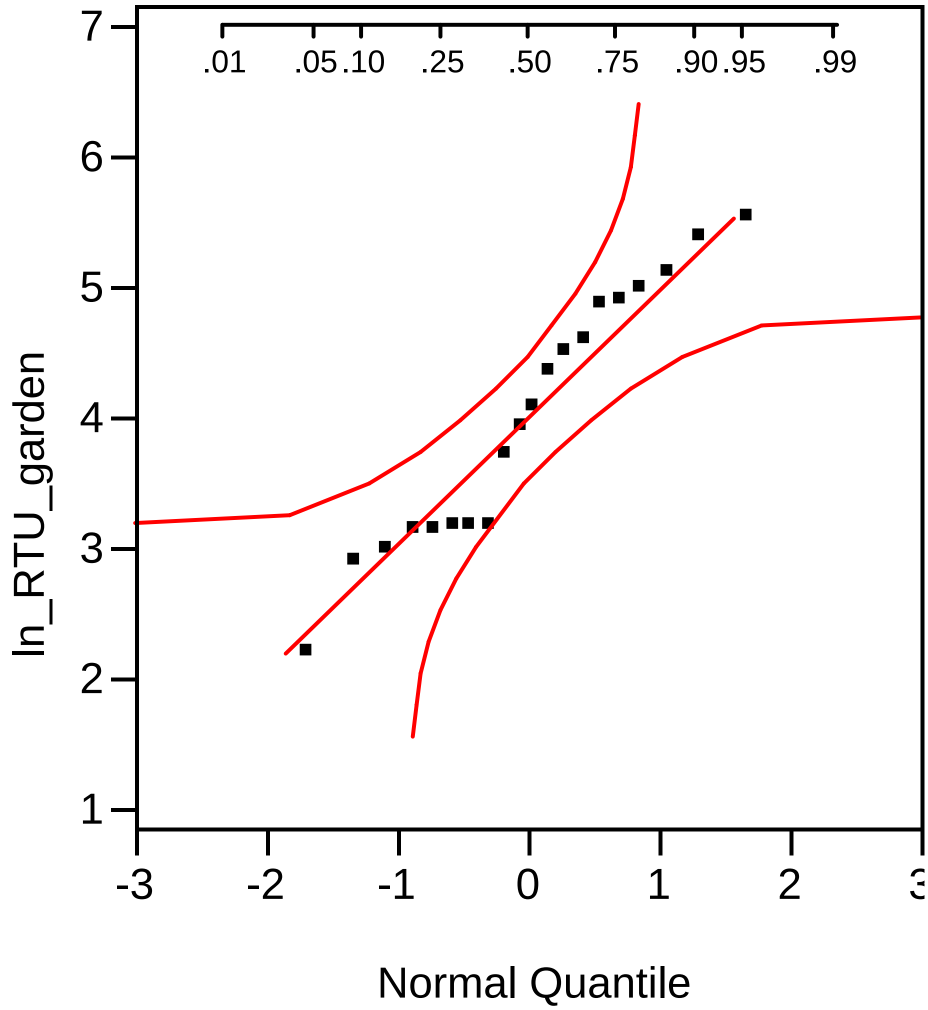


Figure IID.2-9 Lognormal Probability Plot of Trigger Pump Sprayer UE Inhalation Data (MRID 44459801)

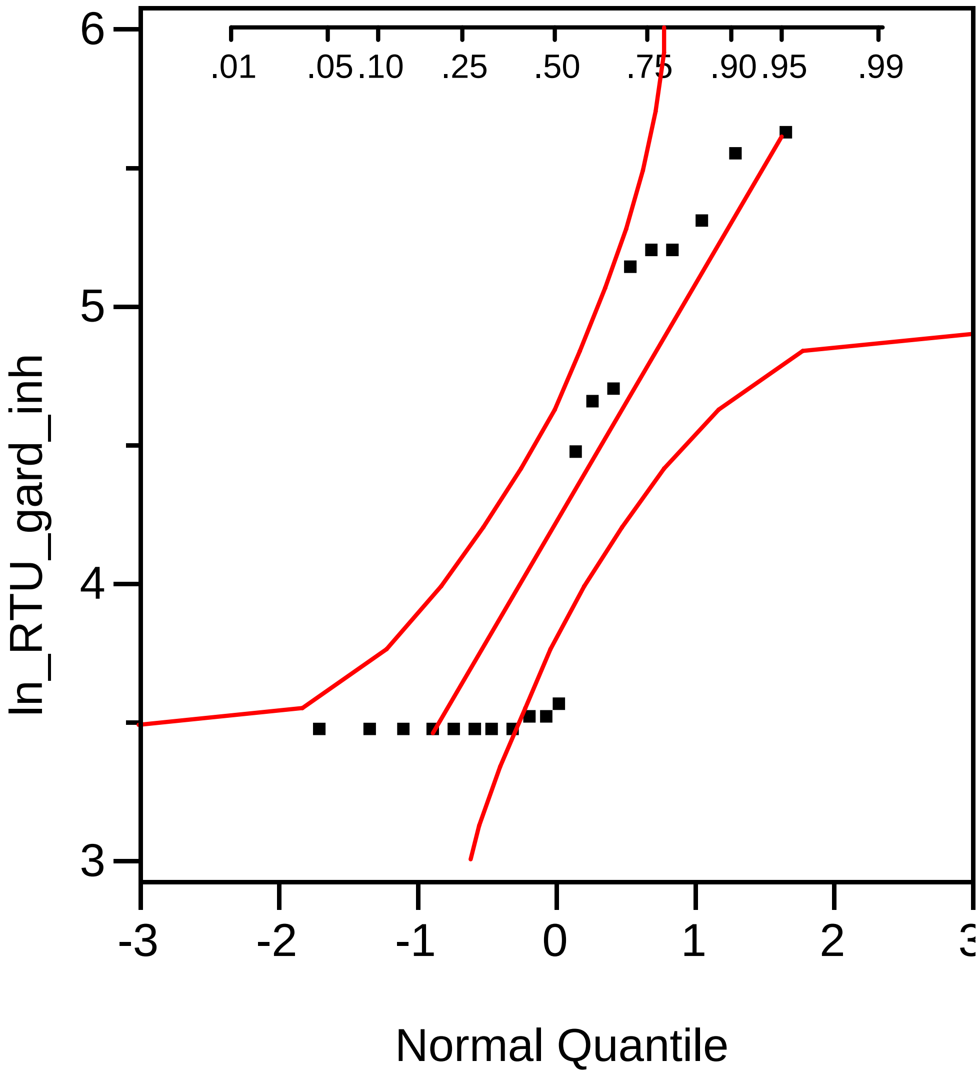


Figure II.D.2-10 Lognormal Probability Plot of Hose End Sprayer Dermal UE Data (MRID44459801)

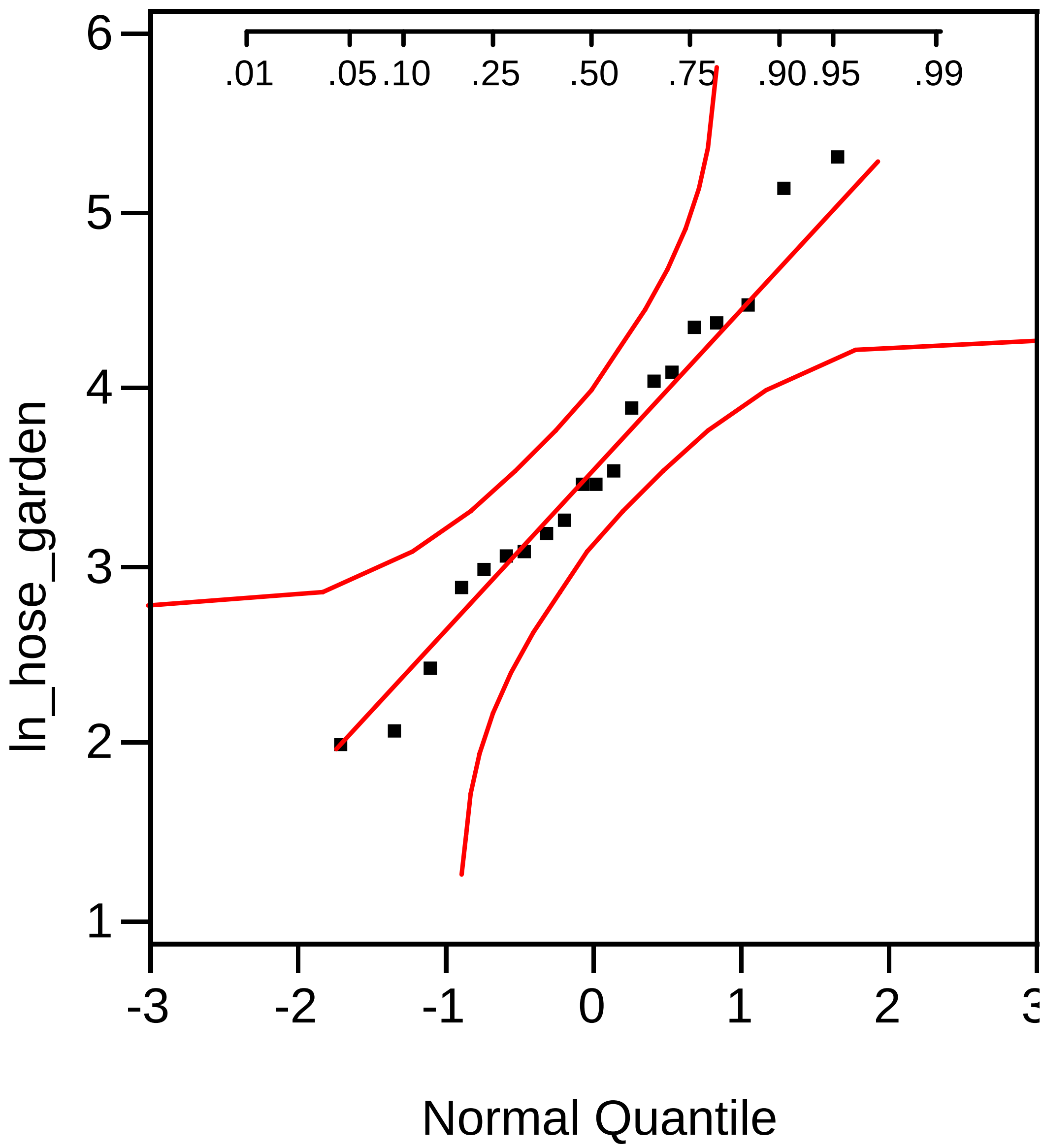
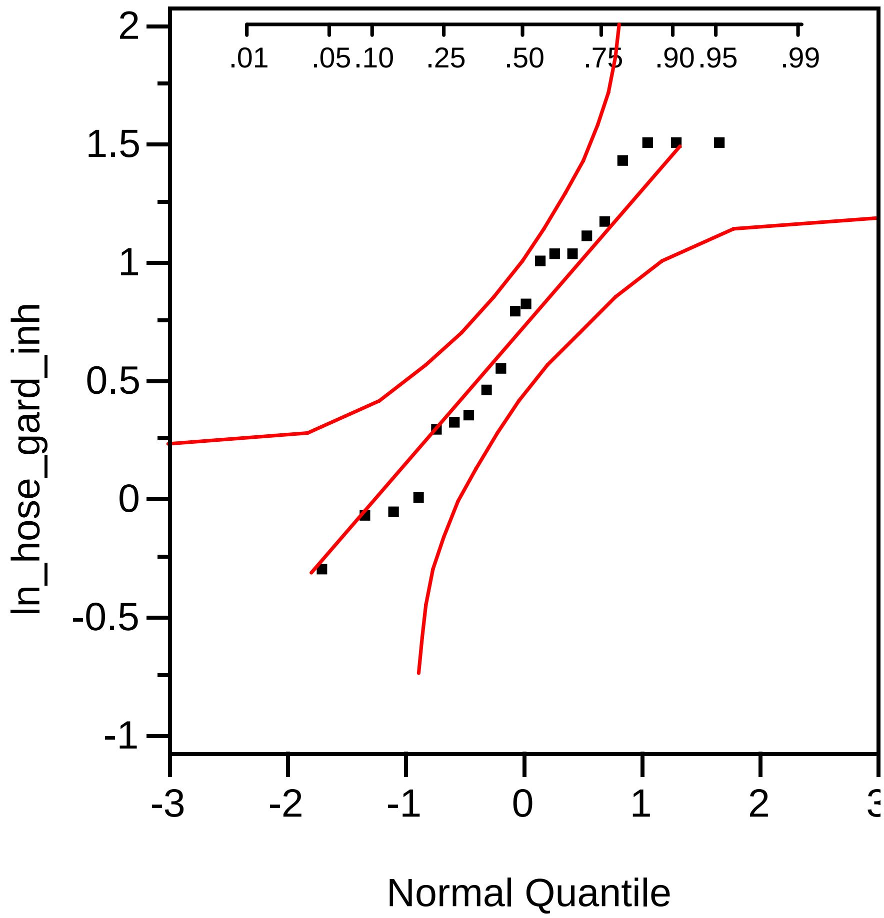


Figure II.D.2-11 Lognormal Probability Plot of Hose End Sprayer Inhalation UE Data (MRID44459801)



For the trigger pump inhalation UE dataset, 11 out of 20 samples were reported as approximately the same value. All 11 samples from the inhalation monitors were reported as 0.07 μg with slightly different amounts of active ingredient handled by the study subjects, which resulted in slightly different UE (mg/lb ai) values. The value 0.07 μg was assumed to be half the LOQ. The mean and standard deviation estimated for the trigger pump inhalation UE dataset are based on maximum likelihood estimation (MLE) procedures assuming the dataset represents a sample from a censored lognormal distribution.

Residue Data

Study Summaries

MRID 45005909 (Carbaryl Sunflower DFR Study): The field phase of this study was conducted at a single site near Northwood, North Dakota. The field phase of the study was conducted during the period from July 20 to August 25, 1998. Sample analyses were completed by December 1998. A fixed-wing aircraft was used to make 2 applications of Sevin XLR Plus, a liquid flowable formulation, 7 days apart at an application rate of 1.5 lb ai/acre. Spray volume was 3 gallons of water per acre. The sunflower plants were approximately 4 feet tall and were spaced approximately 0.5 feet within each row while the rows were spaced 2.5 feet apart (i.e., ~35000 plants/acre). No significant precipitation was observed in this study until at least 14 days after application.

DFR samples were collected out to 28 days after the last application using the Iwata method (i.e., a total surface area sampled of 400 cm2/sample collected with a 1 inch diameter Birkestrand leaf punch and dislodged with a 0.01 percent Aerosol solution). There were still measurable residues 28 days after application. The percent transferability of the 0 day sample was 32 percent of the application rate.

Statistical Details

Dislodgeable foliar residue (DFR) values are assumed to degrade exponentially over time (i.e. degrade by a constant proportion for any given time interval). In order to estimate the initial DFR value (i.e. DFR value at day zero) and the half-life of the liquid formulation of Carbaryl, the natural logarithms of the 30 (3 samples X 10 days) individual DFR samples (Table II.D.2-11) from the sunflower study were linearly regressed on the day of sample collection. The form of the linear regression is given below.

$$\ln(y) = \beta_0 + \beta_1 t$$

The linear regression parameters were then used to calculate initial DFR value (**A_0**) and the half-life (**$T_{1/2}$**) using formulae given below.

$$A_0 = \exp(\beta_0)$$

$$T_{1/2} = -\frac{\ln(2)}{\beta_1}$$

Table II.D.2-11 Liquid Formulation DFR Data (MRID 45005909) Used for Vegetable Garden Scenarios

Day	DFR Values (mg/cm^2)
0	0.00503
	0.00615
	0.00488
1	0.00425
	0.00515
	0.00508
2	0.00415
	0.00295
	0.00380
3	0.00393
	0.00330
	0.00483
4	0.00498
	0.00463
	0.00418
5	0.00241
	0.00205
	0.00310
6	0.00308
	0.00308
	0.00320
7	0.00283
	0.00213
	0.00288
14	0.00139
	0.00116
	0.00108
28	0.00020
	0.00010
	0.00005

Transfer Coefficient Data

Study Summaries

MRID 45344501 (Chrysanthemum Pinching): This study was conducted with volunteer workers pinching buds from greenhouse chrysanthemums after two treatments with the active ingredient (ai) diazainon, formulated as an emulsifiable concentrate called Diazinon AG600 WBC®. Dermal and inhalation data were collected, together with concurrent dislodgeable foliar residue (DFR) data. Potential exposures were measured using whole-body dosimeters (outer and inner dosimetry), hand washes, and face/neck wipes for dermal exposure and personal sampling pumps for inhalation exposure. Transfer coefficients were calculated for potential and total dermal exposure.

4. Ornamental Plants and Shrubs Exposure Scenarios

Unit Exposure Data

Study Summaries

MRID 44459801 (Carbaryl Applications To Vegetable Gardens): The data collected reflect the dermal and respiratory exposure of homeowners mixing, loading and applying RP-2 Liquid (21%), a Carbaryl end-use product. Applications were made by volunteers to two 18 foot rows of tomatoes and one 18 foot row of cucumber. The only test field was located in Florida. For this study, RP-2 Liquid (21%) exposures were monitored using hose-end sprayers and low-pressure hand wand sprayers. Exposures to Sevin® 10 Dust, using a separate duster device that required transfer from the package and Sevin® Ready To Use Insect Spray (RTU) in a trigger sprayer package were also monitored. Exposure for each spray method/product combination was monitored using 40 handlers (replicates). Of the 40 replicates per spray method/product combination, 20 wore household latex gloves and 20 performed tasks without gloves. The 20 dust product replicates loaded the dusters and applied without gloves only.

Each replicate opened the end-use product, added it to the application implement (except the RTU product), adjusted the setting and applied it to the vegetable rows. After application to the vegetable rows, dosimeters were collected. Inhalation exposure was monitored with personal air sampling pumps with OVS tubes attached to the shirt collar in the breathing zone. Dermal exposure was assessed by extraction of carbaryl from inner and outer 100 percent cotton dosimeters, face/neck wipes, and glove and hand washes. The inner and outer dosimeters were segmented into: lower and upper arms, lower and upper legs, front and back torso.

Dermal exposure was determined by adding the values from the bare hand rinses, face/neck wipes to the outer dosimeter lower legs and lower arms plus the inner dosimeter front and rear torso, upper legs, lower legs, lower arms, and upper arms. This accounts for the residential handlers with barehands wearing short-sleeved shirt and short pants.

MRID 44518501 (Carbaryl Applications To Trees And Shrubs Study): Applications of Sevin Liquid® Carbaryl insecticide [RP-2 liquid (21%)] were made by volunteers to two young citrus trees and two shrubs in each replicate that was monitored in the study. The test field was located only in Florida. Twenty (20) replicates were monitored using hose-end sprayer (Ortho® DIAL or Spray® hose end sprayer), and 20 replicates were monitored using hand held pump sprayers (low-pressure hand wands).

Each replicate opened the end-use product, added it to the hose-end sprayer or hand held pump and then applied it to the trees and shrubs. After application to two trees and two shrubs dosimeters were collected. Inhalation exposure was monitored with personal air sampling pumps with OVS tubes attached to the shirt collar in the breathing zone. Dermal exposure was assessed by extraction of Carbaryl from inner and outer 100 percent cotton dosimeters. The inner and outer dosimeters were segmented into: lower and upper arms, lower and upper legs, front and back torso. No gloves were worn therefore hand exposure was assessed with 400 ml handwash with 0.01 percent Aerosol OT-75 sodium dioctyl sulfosuccinate (OTS). One hundred (100) percent cotton handkerchiefs wetted with 25 ml OTS were used to wipe face and neck to determine exposure.

The dermal exposure was calculated by adding the values from the hand rinses, face/neck wipes to the outer dosimeter lower legs and lower arms plus the inner dosimeter front and rear torso, upper legs, lower legs, lower arms, and upper arms. This accounts for the residential handlers with barehands wearing short-sleeved shirt and short pants.

Statistical Details

Distributional parameters were estimated for the dermal and inhalation unit exposure (UE) values for dust (Table II.D.2-12), trigger pump sprayer (Table II.D.2-13), and liquid hand wand sprayer (Table II.D.2-14) applications of carbaryl. All dermal and inhalation UE values represent milligrams exposure per pound of active ingredient of a pesticide handled. All UEs were assumed to be lognormally distributed (i.e. fitted with a lognormal distribution). For each dataset, the shape (α) and scale (β) lognormal parameters were estimated by calculating the mean and standard deviation of the natural logarithms (base *e*) of the UEs. Parametric estimates of the arithmetic mean (μ) and standard deviation (σ) of the lognormal distribution were then calculated based on the shape and scale parameter estimates. The formulae used to calculate the mean and standard deviation are given below.

$$\mu = \exp(\alpha + \tfrac{1}{2}\beta^2)$$

$$\sigma = \mu\sqrt{\exp(\beta^2) - 1}$$

Shapiro-Wilk (S-W) normality test statistics were used to assess the lognormal assumption implicit in the parametric calculations of the mean and standard deviation. The means, standard deviations, and p-values of the S-W statistics are provided in Table II.D.2-15. A small p-value indicates that logarithms of the UEs are not normally distributed, or equivalently, that the UEs are not lognormally distributed. The dust inhalation UE, trigger pump inhalation

UE, and hand wand UE datasets resulted in S-W statistics with p-values less than 0.05.

Table II.D.2-12 Dust Shaker/Powder UE Data (MRID 44459801) Used for Ornamental Plants and Shrubs Scenarios

Dermal UE Values (mg/lb ai)	Inhalation UE Values (mg/lb ai)
673	2.27
588	0.60
276	1.38
129	2.23
176	0.30
94	0.61
236	4.87
229	0.01
85	2.11
69	0.38
82	2.14
258	0.66
51	1.99
1388	14.27
40	0.13
280	1.09
43	1.40
36	0.57
219	2.28
59	0.26

Table II.D.2-13 Trigger Pump Sprayer UE Data (MRID #44459801) Used for Ornamental Plants and Shrubs Scenarios

Dermal UE Values (mg/lb ai)	Inhalation UE Values (mg/lb ai)
129	0.275
59	0.255
250	0.104
132	0.168
145	0.180
91	0.032
165	0.180
77	0.200
24	0.033
50	0.032
24	0.033
100	0.086
23	0.032
24	0.110
20	0.035
218	0.032
9	0.032
18	0.032
41	0.032
23	0.032

Table II.D.2-14 Hand Wand Sprayer UE Data (MRID 44518501) Used for Ornamental Plants and Shrubs Scenarios

Dermal UE Values (mg/lb ai)	Inhalation UE Values (mg/lb ai)
25	0.004
52	0.005
129	0.004
27	0.004
348	0.005
56	0.005
118	0.004
176	0.016
44	0.009
41	0.016
46	0.004
15	0.004
36	0.004
83	0.004
78	0.025

78	0.012
46	0.004
36	0.022
25	0.004
63	0.018

Table II.D.2-15 Lognormal Distributions of UEs Used for Ornamental Plants and Shrubs Scenarios

Application Method	Exposure Route	Unit Exposure Distribution (mg/lb ai)	Shapiro-Wilk p-value
Dust Shaker/Powder	Dermal	LN(247, 333)	0.3691
	Inhalation	LN(2.94, 9.54)	0.0354
Trigger Pump Sprayer	Dermal	LN(86, 107)	0.2191
	Inhalation	LN(0.104, 0.137)*	0.0003
Hand Wand Sprayer	Dermal	LN(74, 64)	0.7478
	Inhalation	LN(0.0089, 0.0102)*	0.0005
NOTES: LN(μ, σ) represents a lognormal distribution with mean=μ and standard deviation=σ. *The mean and standard deviation represent MLE-based estimates.			

Additionally, probability plots were used to qualitatively assess the appropriateness of the lognormal assumptions. Generally a probability plot displays the actual values of a dataset (represented as points) and their expected values (represented as a line) for the specified distribution. The closer the actual values are to their expected values (i.e. the more the actual values approximate a straight line), the more likely the dataset is of the specified distribution. The probability plots for the UE datasets are provided in Figures II.D.2-12 through 17. For the dust inhalation UE dataset, the probability plot indicates that the small S-W p-value is due to one very low value; whereas for the trigger pump inhalation and hand wand inhalation UE datasets, several low values account for the small S-W p-values. The other datasets are reasonably approximated by lognormal distributions.

Figure II.D.2-12 Lognormal Probability Plot of Dust Shaker/Powder Dermal UE Data (MRID 44459801)

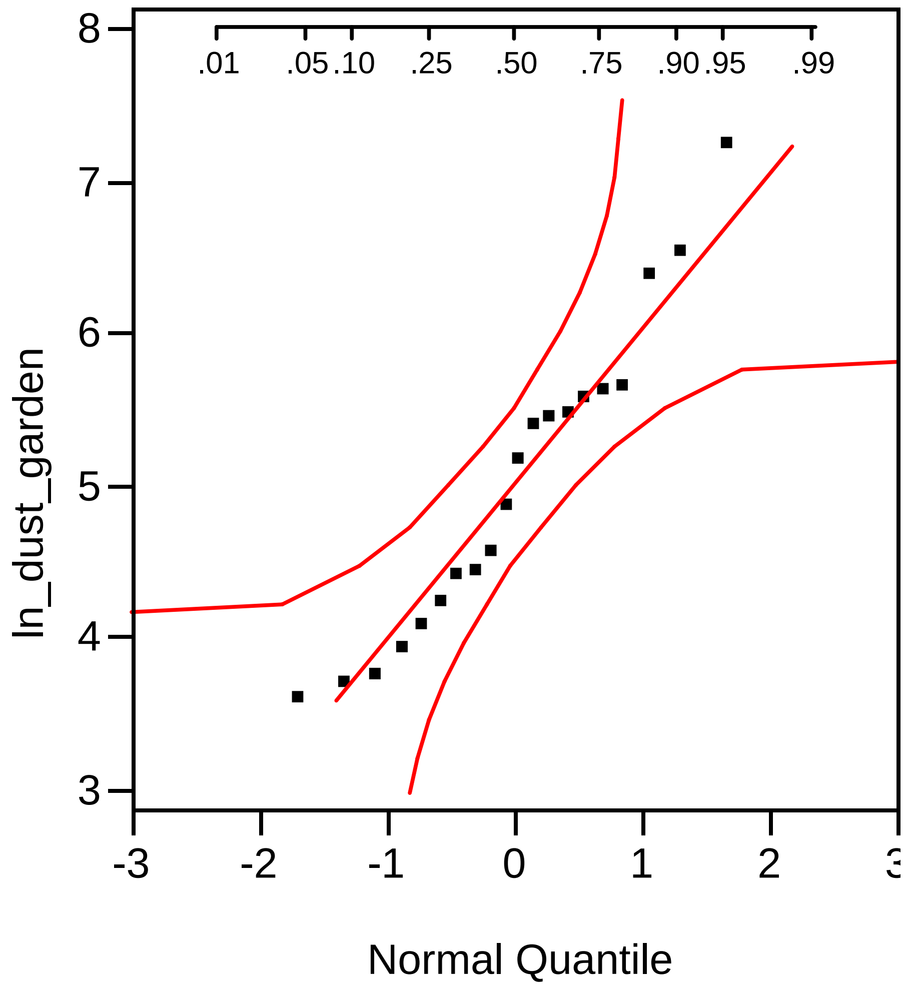


Figure II.D.2-13 Lognormal Probability Plot of Dust Shaker/Powder Inhalation UE Data (MRID 44459801)

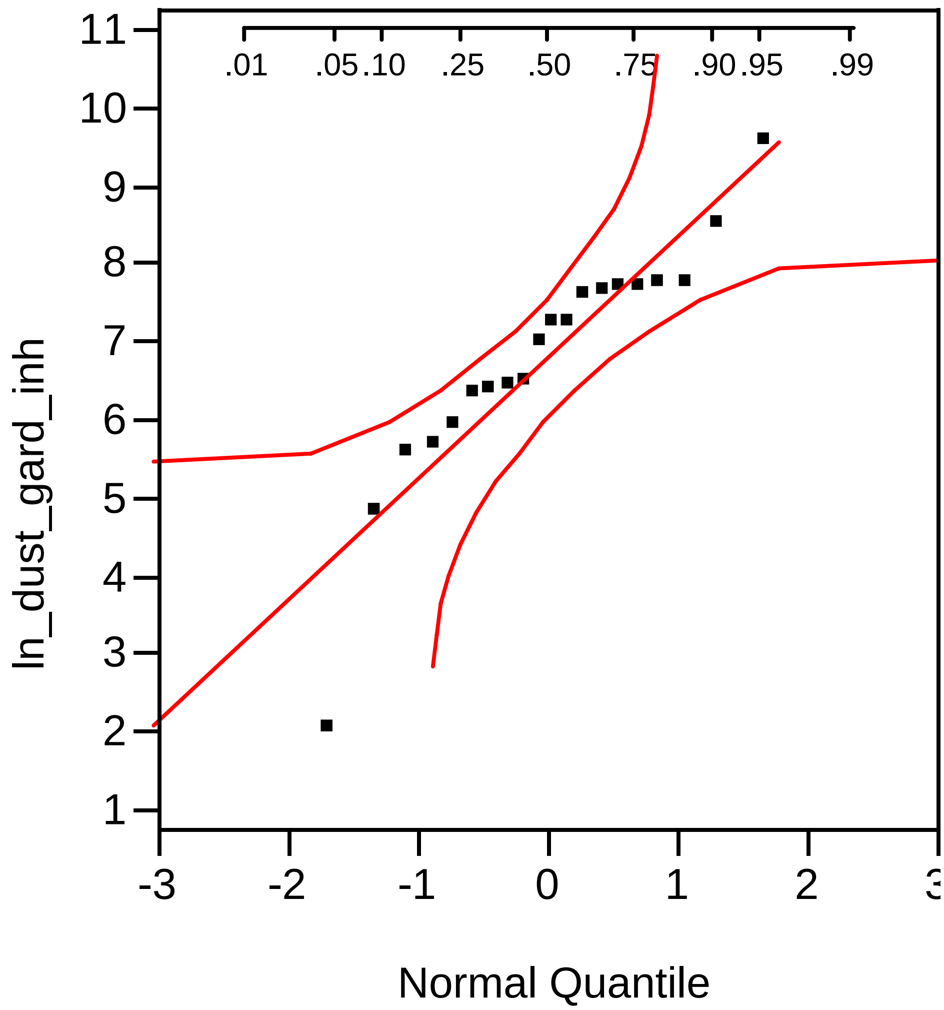


Figure II.D.2-14 Lognormal Probability Plot of Trigger Pump Sprayer Dermal UE Data (MRID #44459801)

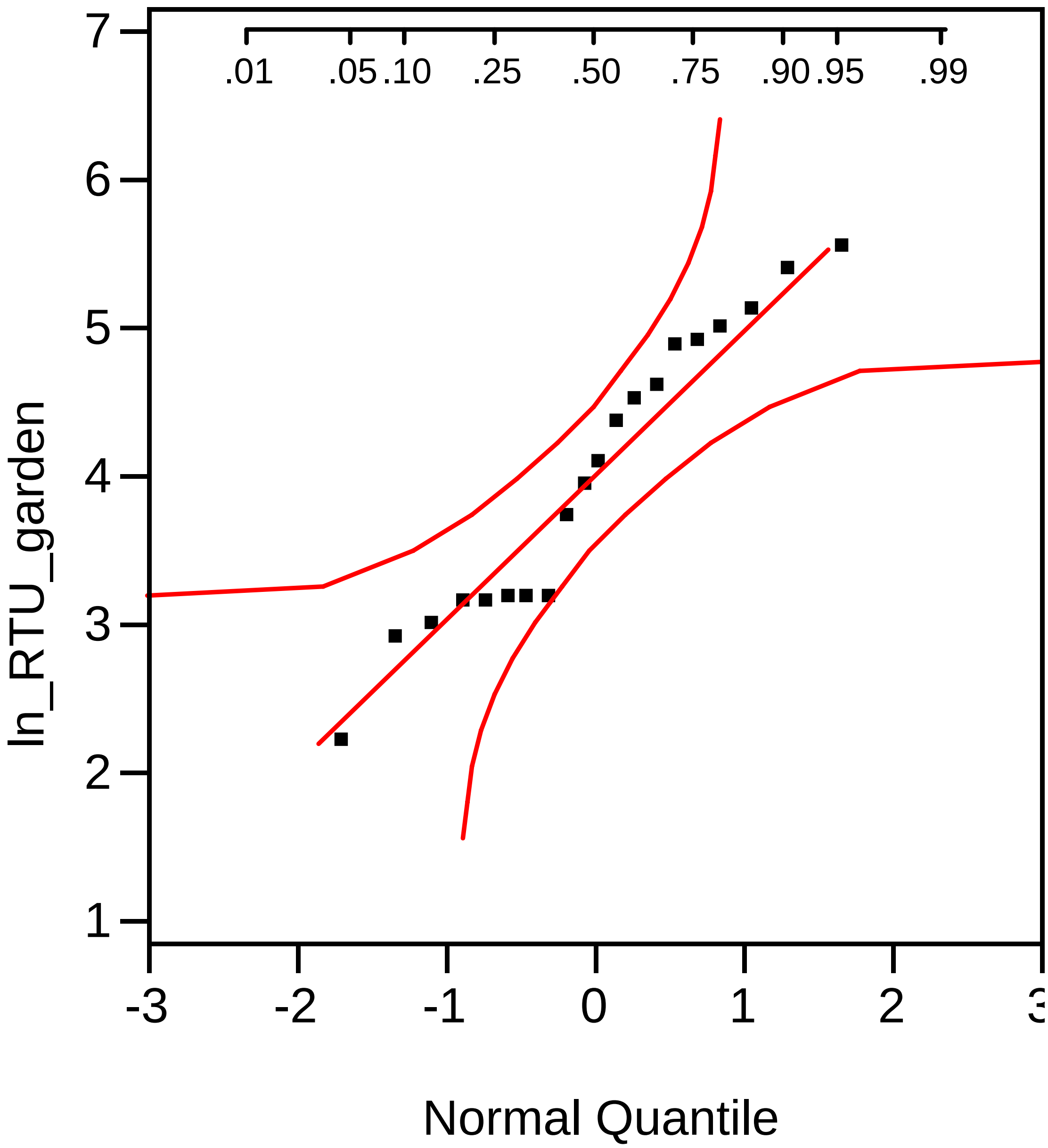


Figure II.D.2-15 Lognormal Probability Plot of Trigger Pump Sprayer Inhalation UE Data (MRID #44459801)

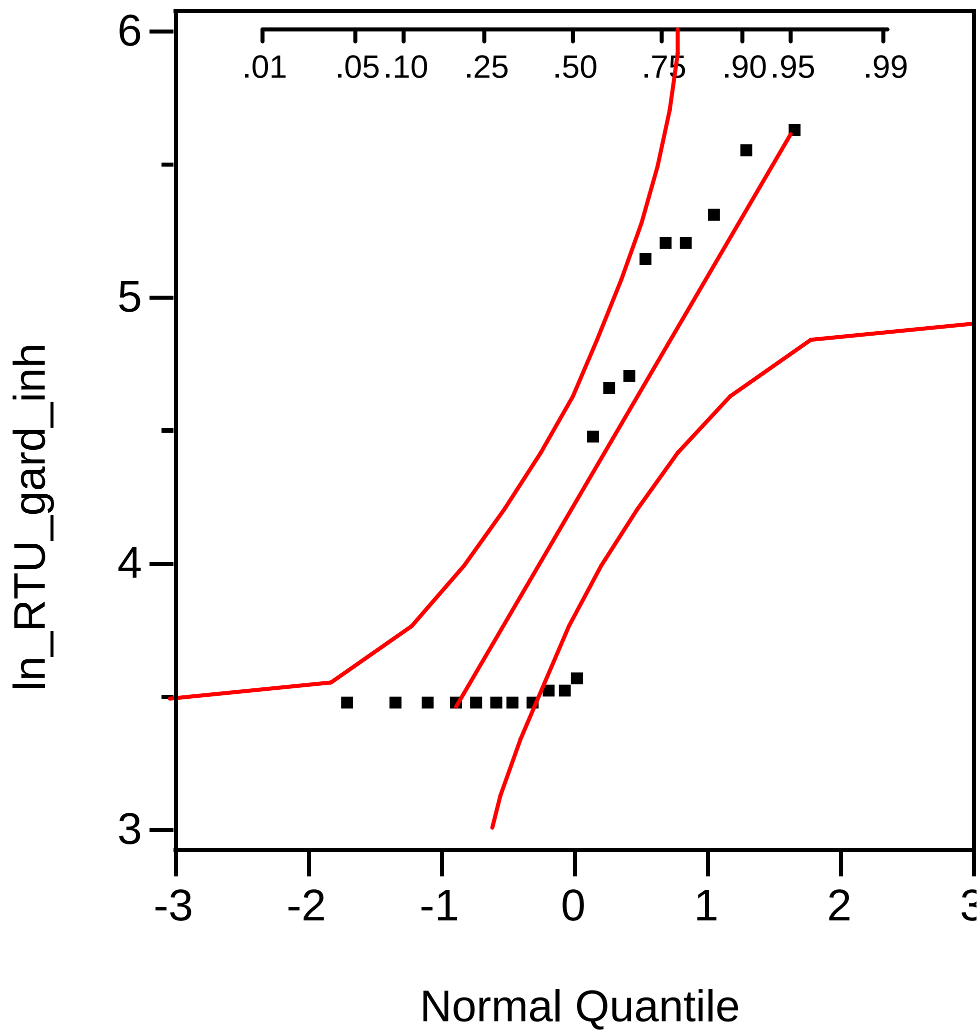


Figure II.D.2-16 Lognormal Probability Plot of Hand Wand Sprayer Dermal UE Data (MRID 44518501)

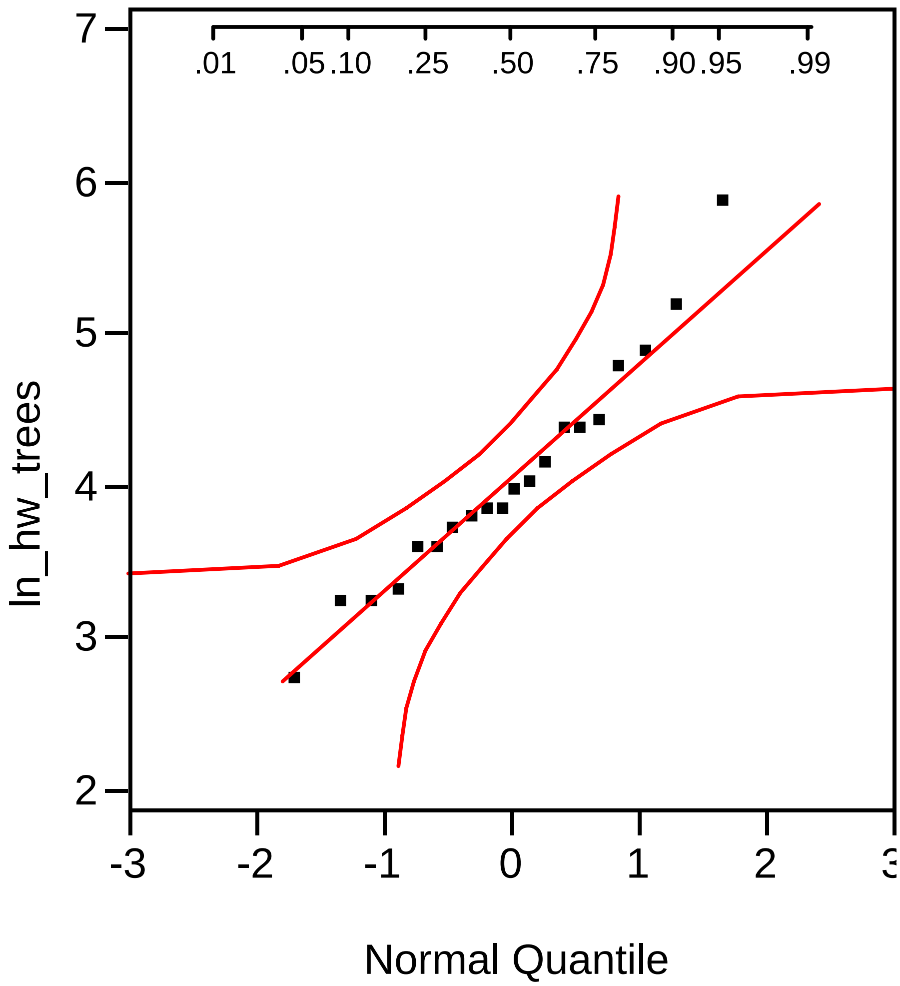
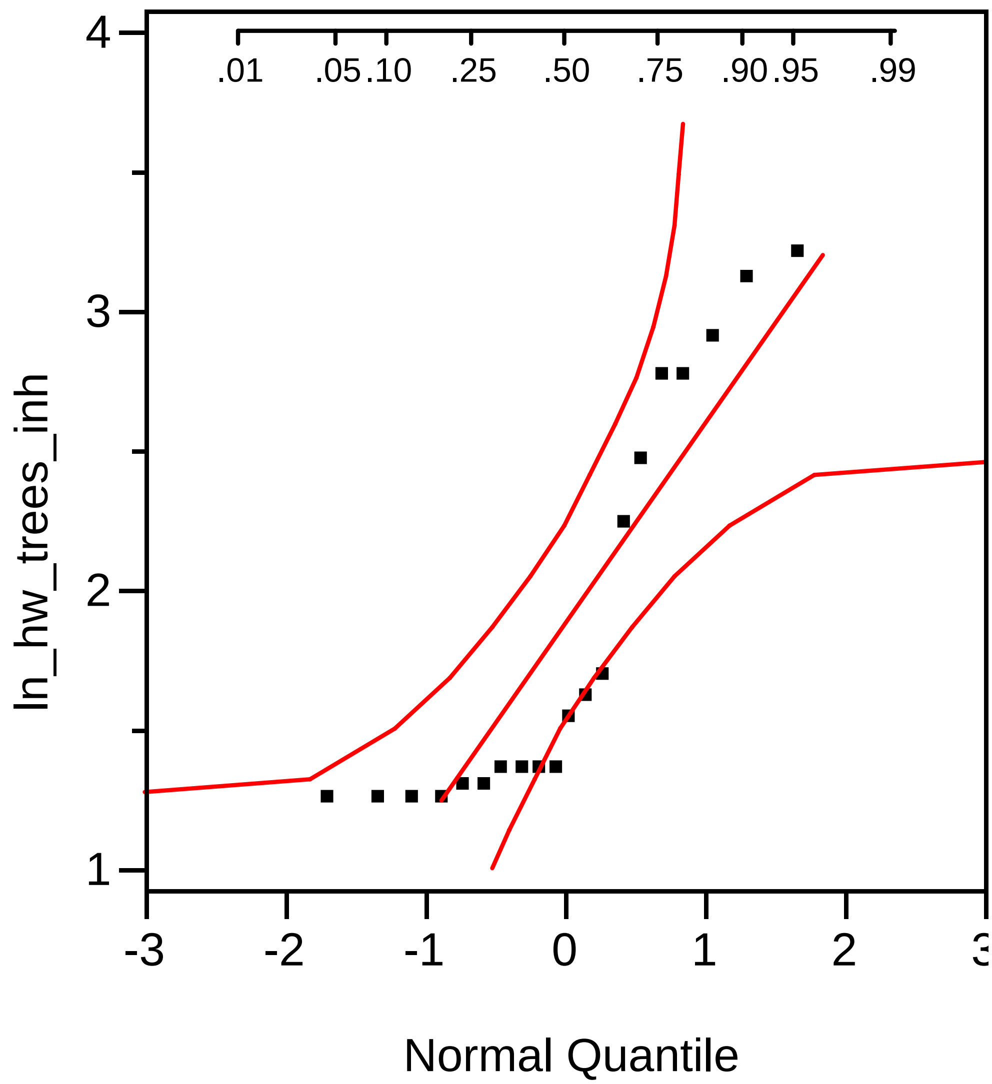


Figure II.D.2-17 Lognormal Probability Plot of Hand Wand Sprayer Inhalation UE Data (MRID 44518501)



For the trigger pump inhalation and hand wand inhalation UE datasets, 11 and 13 (respectively) out of 20 samples were reported as approximately the same value. All 24 samples from the inhalation monitors were reported as 0.07 μg with slightly different amounts of active ingredient handled by the study subjects, which resulted in slightly different UE (mg/lb ai) values. The value 0.07 μg was assumed to be half the LOQ. The means and standard deviations estimated for the trigger pump inhalation UE and hand wand inhalation UE datasets are based on maximum likelihood estimation (MLE) procedures assuming the datasets represent samples from censored lognormal distributions.

Transfer Coefficient Data

Study Summaries

MRID 45344501 (Chrysanthemum Pinching): This study was conducted with volunteer workers pinching buds from greenhouse chrysanthemums after two treatments with the surrogate active ingredient (ai) diazainon, formulated as an emulsifiable concentrate called Diazinon AG600 WBC®. Dermal and inhalation data were collected, together with concurrent dislodgeable foliar residue (DFR) data. Potential exposures were measured using whole-body dosimeters (outer and inner dosimetry), hand washes, and face/neck wipes for dermal exposure and personal sampling pumps for inhalation exposure. Transfer coefficients were calculated for potential and total dermal exposure.

MRID 45469501 (Pruning in Nursery Stock): This study was conducted with volunteer workers pruning in a citrus nursery stock after one treatment with the surrogate active ingredient (ai) malathion, formulated as the emulsifiable concentrate. The potential dermal and respiratory exposure during reentry was assessed at a citrus nursery in Arizona by using whole-body dosimetry, hand washes, face/neck wipes, and a personal air sampling pump. Dermal and inhalation data were collected, together with concurrent dislodgeable foliar residue (DFR) data. Transfer coefficients were calculated for both potential and total dermal exposure.

Residue Data

Study Summaries

MRID 45005909 (Carbaryl Sunflower DFR Study): The field phase of this study was conducted at a single site near Northwood, North Dakota. The field phase of the study was conducted during the period from July 20 to August 25, 1998. Sample analyses were completed by December 1998. A fixed-wing aircraft was used to make 2 applications of Sevin XLR Plus, a liquid flowable formulation, 7 days apart at an application rate of 1.5 lb ai/acre. Spray volume was 3 gallons of water per acre. The sunflower plants were approximately 4 feet tall and were spaced approximately 0.5 feet within each row while the rows were spaced 2.5 feet apart (i.e., ~35000 plants/acre). No significant precipitation was observed in this study until at least 14 days after application.

DFR samples were collected out to 28 days after the last application using the Iwata method (i.e., a total surface area sampled of 400 cm2/sample collected with a 1 inch diameter Birkestrand leaf punch and dislodged with a 0.01 percent Aerosol solution). There were still measurable residues 28 days after application. The percent transferability of the 0 day sample was 32 percent of the application rate.

Statistical Details

Dislodgeable foliar residue (DFR) values are assumed to degrade exponentially over time (i.e. degrade by a constant proportion for any given time interval). In order to estimate the initial DFR value (i.e. DFR value at day zero) and the half-life of the liquid formulation of carbaryl, the natural logarithms of the 30 (3 samples X 10 days) individual DFR samples (Table II.D.2-16) from the sunflower study were linearly regressed on the day of sample collection. The form of the linear regression is given below.

$$\ln(y) = \beta_0 + \beta_1 t$$

The linear regression parameters were then used to calculate initial DFR value (**A_0**) and the half-life (**$T_{1/2}$**) using formulae given below.

$$A_0 = \exp(\beta_0)$$

$$T_{1/2} = -\frac{\ln(2)}{\beta_1}$$

Table II.D.2-16 Liquid Formulation DFR Data (MRID #45005909) Used for Ornamental Plants and Shrubs Scenarios

Day	DFR Values (mg/cm^2)
0	0.00503
	0.00615
	0.00488
1	0.00425
	0.00515
	0.00508
2	0.00415
	0.00295
	0.00380
3	0.00393
	0.00330
	0.00483
4	0.00498
	0.00463
	0.00418
5	0.00241
	0.00205
	0.00310
6	0.00308
	0.00308
	0.00320
7	0.00283
	0.00213
	0.00288
14	0.00139
	0.00116

	0.00108
28	0.00020
	0.00010
	0.00005

5. Fruit Tree Exposure Scenarios

Unit Exposure Data

Study Summaries

MRID 44518501 (Carbaryl Applications To Trees And Shrubs): Applications of Sevin Liquid® Carbaryl insecticide [RP-2 liquid (21%)] were made by volunteers to two young citrus trees and two shrubs in each replicate that was monitored in the study. The test field was located only in Florida. Twenty (20) replicates were monitored using hose-end sprayer (Ortho® DIAL or Spray® hose end sprayer), and 20 replicates were monitored using hand held pump sprayers (low pressure hand wands).

Each replicate opened the end-use product, added it to the hose-end sprayer or hand held pump and then applied it to the trees and shrubs. After application to two trees and two shrubs dosimeters were collected. Inhalation exposure was monitored with personal air sampling pumps with OVS tubes attached to the shirt collar in the breathing zone. Dermal exposure was assessed by extraction of Carbaryl from inner and outer 100 percent cotton dosimeters. The inner and outer dosimeters were segmented into: lower and upper arms, lower and upper legs, front and back torso. No gloves were worn therefore hand exposure was assessed with 400 ml handwash with 0.01 percent Aerosol OT-75 sodium dioctyl sulfosuccinate (OTS). One hundred (100) percent cotton handkerchiefs wetted with 25 ml OTS were used to wipe face and neck to determine exposure.

The dermal exposure was calculated by adding the values from the hand rinses, face/neck wipes to the outer dosimeter lower legs and lower arms plus the inner dosimeter front and rear torso, upper legs, lower legs, lower arms, and upper arms. This accounts for the residential handlers with barehands wearing short-sleeved shirt and short pants.

Statistical Details

Distributional parameters were estimated for the dermal and inhalation unit exposure (UE) values for liquid hand wand sprayer (Table II.D.2-17) applications of Carbaryl. Dermal and inhalation UE values represent milligrams exposure per pound of active ingredient of a pesticide handled. All UEs were assumed to be lognormally distributed (i.e. fitted with a lognormal distribution). For each dataset, the shape (α) and scale (β) lognormal parameters were estimated by calculating the mean and standard deviation of the natural logarithms (base *e*) of the UEs. Parametric estimates of the arithmetic mean (μ) and standard deviation (σ) of the lognormal distribution were then calculated based on the shape and scale parameter estimates. The formulae used to calculate the mean and standard deviation are given below.

$$\mu = \exp(\alpha + \tfrac{1}{2}\beta^2)$$

$$\sigma = \mu\sqrt{\exp(\beta^2) - 1}$$

Shapiro-Wilk (S-W) normality test statistics were used to assess the lognormal assumption implicit in the parametric calculations of the mean and standard deviation. The means, standard deviations, and p-values of the S-W statistics are provided in Table II.D.2-18. A small p-value indicates that logarithms of the UEs are not normally distributed, or equivalently, that the UEs are not lognormally distributed. The hand wand UE dataset resulted in an S-W statistic with a p-value less than 0.05.

Table II.D.2-17 Hand Wand Sprayer UE Data (MRID #44518501) Used for Fruit Tree Scenarios

Dermal UE Values (mg/lb ai)	Inhalation UE Values (mg/lb ai)
25	0.004
52	0.005
129	0.004
27	0.004
348	0.005
56	0.005
118	0.004
176	0.016
44	0.009
41	0.016
46	0.004
15	0.004
36	0.004
83	0.004
78	0.025
78	0.012
46	0.004
36	0.022
25	0.004
63	0.018

Table II.D.2-18 Lognormal Distributions of UEs Used for Fruit Tree Scenarios

Application Method	Exposure Route	Unit Exposure Distribution (mg/lb ai)	Shapiro-Wilk p-value
Hand Wand Sprayer	Dermal	LN(74, 64)	0.7478
	Inhalation	LN(0.0089, 0.0102)*	0.0005
NOTES: LN(μ, σ) represents a lognormal distribution with mean=μ and standard deviation=σ. *The mean and standard deviation represent MLE-based estimates.			

Additionally, probability plots were used to qualitatively assess the appropriateness of the lognormal assumptions. Generally a probability plot displays the actual values of a dataset (represented as points) and their expected values (represented as a line) for the specified distribution. The closer the actual values are to their expected values (i.e. the more the actual values approximate a straight line), the more likely the dataset is of the specified distribution. The probability plots for the UE datasets are provided in Figures II.D.2-18 and 19. For the hand wand inhalation UE dataset, several low values result in a small S-W p-value. The other dataset is reasonably approximated by a lognormal distribution.

Figure II.D.2-18 Lognormal Probability Plot of Hand Wand Sprayer Dermal UE Data (MRID #44518501)

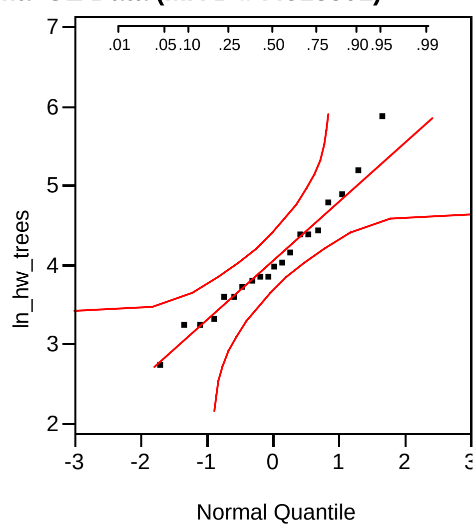
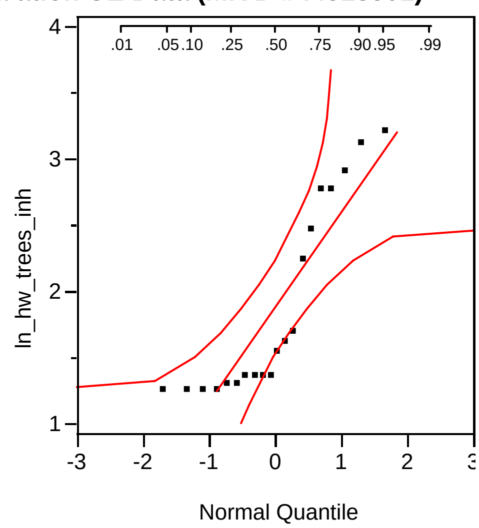


Figure II.D.2-19 Lognormal Probability Plot of Hand Wand Sprayer Inhalation UE Data (MRID #44518501)



For the hand wand inhalation UE dataset, 13 out of 20 samples were reported as approximately the same value. All 13 samples from the inhalation monitors were reported as 0.07 μg with slightly different amounts of active ingredient handled by the study subjects, which resulted in slightly different UE (mg/lb ai) values. The value 0.07 μg was assumed to be half the LOQ. The mean and standard deviation estimated for hand wand inhalation UE dataset are based on maximum likelihood estimation (MLE) procedures assuming the dataset represents a sample from a censored lognormal distribution.

Residue Data

Study Summaries

MRID 45175102 (Carbaryl Olive DFR Study): The field phase of this study was conducted at a single site near Terra Bella, California which is in a major growing region for olives. The field phase of the study was conducted during the period from November 2 to November 17, 1998. Sample analyses were completed by January, 1999. A typical airblast sprayer was used to make a single application of Sevin XLR Plus, a liquid flowable formulation, at an application rate of 7.65 lb ai/acre. Spray volume was 758 gallons of water per acre. The olive trees were approximately 20 feet tall and were spaced approximately 28 feet within each row while the rows were spaced 28 feet apart (i.e., ~56 trees/acre). No significant precipitation was observed in this study until at least 7 days after application.

Triplicate DFR samples were collected out to 14 days after application using the Iwata method (i.e., a total surface area sampled of 400 cm2/sample collected with a 1 inch diameter Birkestrand leaf punch and dislodged with a 0.01 percent Aerosol solution). There were still measurable residues 14 days after application. The percent transferability of the 0 day sample was 3.6 percent of the application rate.

Statistical Details

Dislodgeable foliar residue (DFR) values are assumed to degrade exponentially over time (i.e. degrade by a constant proportion for any given time interval). In order to estimate the initial DFR value (i.e. DFR value at day zero) and the half-life of the liquid formulation of carbaryl, the natural logarithms of the 30 (3 samples X 10 days) individual DFR samples (Table II.D.2-19) from the olive study were linearly regressed on the day of sample collection. The form of the linear regression is given below.

$$\ln(y) = \beta_0 + \beta_1 t$$

The linear regression parameters were then used to calculate initial DFR value (**A_0**) and the half-life (**$T_{1/2}$**) using formulae given below.

$$A_0 = \exp(\beta_0)$$

$$T_{1/2} = -\frac{\ln(2)}{\beta_1}$$

Table II.D.2-19 Liquid Formulation DFR Data (MRID 45175102) Used for Fruit Tree Scenarios

Day	DFR Values (mg/cm^2)
0	0.0035
	0.0027
	0.0030
1	0.0028
	0.0023
	0.0028
2	0.0027
	0.0024
	0.0025
3	0.0042
	0.0029
	0.0027
4	0.0028
	0.0024
	0.0028
5	0.0023
	0.0019
	0.0018
6	0.0026
	0.0023
	0.0022
7	0.0028
	0.0023
	0.0020
10	0.0012
	0.0010
	0.0010
14	0.0009
	0.0008
	0.0007

Transfer Coefficient Data

Study Summaries

MRID 45480302 (Hand Pruning Apples): This study was conducted with volunteer workers pruning commercially grown apple trees after two treatments with the surrogate active ingredient (ai) carbaryl, formulated as the flowable insecticide Sevin® XLR PLUS. Dermal and inhalation data were collected, together with concurrent dislodgeable foliar residue (DFR) data. Potential exposures were measured using whole-body dosimeters (outer and inner dosimetry), hand washes, and face/neck wipes for dermal exposure and personal sampling pumps for inhalation exposure. Transfer coefficients for potential and total dermal exposure were calculated.

Statistical Details

Distributional parameters were estimated for the adult TC transfer coefficient (TC) values (Table II.D.2-20) from the apple pruning study. TC values were expressed as square centimeters per hour. Adult TCs were assumed to be lognormally distributed (i.e. fitted with a lognormal distribution). For the TC dataset, the shape (α) and scale (β) lognormal parameters were estimated by calculating the mean and standard deviation of the natural logarithms (base *e*) of the TCs. Parametric estimates of the arithmetic mean (μ) and standard deviation (σ) of the lognormal distribution were then calculated based on the shape and scale parameter estimates. The formulae used to calculate the mean and standard deviation are given below.

$$\mu = \exp(\alpha + \tfrac{1}{2}\beta^2)$$

$$\sigma = \mu\sqrt{\exp(\beta^2) - 1}$$

Shapiro-Wilk (S-W) normality test statistics were used to assess the lognormal assumption implicit in the parametric calculations of the mean and standard deviation. The mean, standard deviation, and p-value of the S-W statistic are provided in Table II.D.2-21. A small p-value indicates that logarithms of the TCs are not normally distributed, or equivalently, that the TCs are not lognormally distributed. For the adult TC dataset, the S-W p-value is greater than 0.05.

Table II.D.2-20 Liquid Formulation TC Data (MRID 45480302) Used for Fruit Tree Scenarios

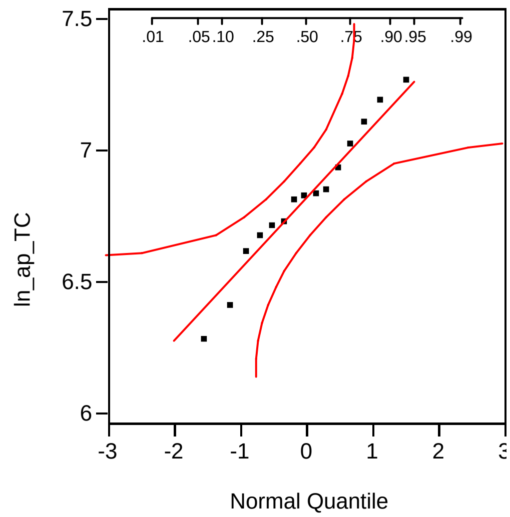
TC Values (cm^2/hr)
1119
920
903
787
534
1421
1316
940
1217
740
821
928
831
1020
606

Table II.D.2-21 Lognormal Distribution of TCs Used for Fruit Tree Scenarios

Exposure Route	Population	Transfer Coefficient Distribution (cm^2/hr)	Shapiro-Wilk p-value
Dermal	Adult	LN(943, 258)	0.9300
NOTES: LN(μ, σ) represents a lognormal distribution with mean=μ and standard deviation=σ.			

Additionally, a probability plot was used to qualitatively assess the appropriateness of the lognormal assumption. Generally a probability plot displays the actual values of a dataset (represented as points) and their expected values (represented as a line) for the specified distribution. The closer the actual values are to their expected values (i.e. the more the actual values approximate a straight line), the more likely the dataset is of the specified distribution. The probability plot for the TC dataset is provided in Figure II.D.2-20. The probability plot indicates that the TC dataset is reasonably approximated by a lognormal distribution.

Figure II.D.2-20 Lognormal Probability Plot of Liquid Formulation TC Data (MRID 45480302)



6. Ornamental Garden- Snail and Slug Bait Scenario

Unit Exposure Data

Study Summaries

MRID 45333401 (Dermal and Inhalation Exposure to Disulfoton Resulting from Residential Application to Shrubs and Flower Beds): The purpose of this study was to quantify potential dermal (forearm and hand) and inhalation exposure for residential applicators a granular disolfoton formulation, which contains 1.04 percent disulfoton as the active ingredient. The maximum application rate for flower beds (4 ounces formulated product per 12 square feet) and for shrubs, which includes rosebushes, (4 ounces formulated product per 1 foot shrub height) was used in this study.

The field study was conducted at the Bayer Corporation Research Farm, Vero Beach, Florida. A total of 15 volunteers were monitored using passive dosimetry (hand/forearm wash solutions and personal air monitors). Application of the product was made by pouring the granules into the measuring cup/lid attached to the product package, and then distributing the granules onto the soil around the base of a shrub or onto a flower bed. The granules were then soil-incorporated with a garden rake. Each volunteer applied granular disulfoton around shrubs while wearing gloves and then again without gloves. A total of 60 (i.e., 15 volunteers x 4 exposure scenarios) replicates were monitored. Only exposure data from the 30 replicates who did <u>not</u> wear gloves were reported. The test site was a fallow test field, approximately 1 acre in size. Two sets of sub-plots were established: (1) shrub test-plots, each containing 10 oleander shrubs (approximately 48 inches high); and (2) flower-bed sub-plots, each containing simulated plants, (e.g., 12 to 14 inch high stakes placed on approximately 24 inch centers).

Each volunteer applied approximately 10 pounds of formulated product per application. Shrubs were treated by spreading 16 ounces of granules (i.e., 4 ounces per 1 foot of shrub) in a circle around each shrub's base. The granules were then incorporated into the top 1-2 inches of soil using a new garden rake. Flower beds were treated by sprinkling 4 ounces of granules to each 12 square feet of a total 480 square feet area, and incorporating the product into the top 1-2 inches of soil using a new garden rake.

All of the inhalation exposure data were either non-detect or less than the limit of quantitation (LOQ). Most of the hand/forearm dermal washing samples returned results greater than the LOQ. The author reported that the time it took to treat shrubs ranged between 18 and 29 minutes. The time that it took to treat flowerbeds ranged between 20 and 40 minutes.

Statistical Details

Distributional parameters were estimated for the dermal unit exposure (UE) values (Table II.D.2-22) for the granular formulation of chemical H based on surrogate chemical data. Dermal UE values represent milligrams exposure per pound of active ingredient of a pesticide handled. All UEs were assumed to be lognormally distributed (i.e. fitted with a lognormal distribution). For the dataset, the shape (α) and scale (β) lognormal parameters were estimated by calculating the mean and standard deviation of the natural logarithms (base *e*) of the UEs. Parametric estimates of the arithmetic mean (μ) and standard deviation (σ) of the lognormal distribution were then calculated based on the shape and scale parameter estimates. The formulae used to calculate the mean and standard deviation are given below.

$$\mu = \exp(\alpha + \tfrac{1}{2}\beta^2)$$

$$\sigma = \mu\sqrt{\exp(\beta^2) - 1}$$

The Shapiro-Wilk (S-W) normality test statistic was used to assess the lognormal assumption implicit in the parametric calculations of the mean and standard deviation. The mean, standard deviation, and p-value of the S-W statistic are provided in Table II.D.2-23. A small p-value indicates that logarithms of the UEs are not normally distributed, or equivalently, that the UEs are not lognormally distributed. The granular dermal UE dataset resulted in an S-W statistic with a p-value less than 0.05.

Table II.D.2-22 Granular UE Data (MRID 45333401) Used for Ornamental Garden Scenarios

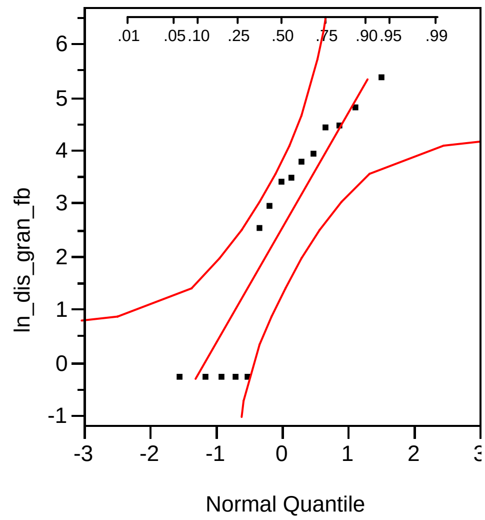
Dermal UE Values (mg/lb ai)
0.001
0.029
0.019
0.206
0.085
0.001
0.001
0.001
0.042
0.050
0.012
0.032
0.119
0.001
0.082

Table II.D.2-23 Lognormal Distribution of UEs Used for Ornamental Garden Scenarios

Application Method	Exposure Route	Unit Exposure Distribution (mg/lb ai)	Shapiro-Wilk p-value
Granular	Dermal	LN(0.23, 5.8)*	0.0087
NOTES: LN(μ, σ) represents a lognormal distribution with mean=μ and standard deviation=σ. *The mean and standard deviation represent MLE-based estimates.			

Additionally, a probability plot was used to qualitatively assess the appropriateness of the lognormal assumption. Generally a probability plot displays the actual values of a dataset (represented as points) and their expected values (represented as a line) for the specified distribution. The closer the actual values are to their expected values (i.e. the more the actual values approximate a straight line), the more likely the dataset is of the specified distribution. The probability plot for the UE dataset is provided in Figure II.D.2-21. For the granular dermal UE dataset, several low values result in a small S-W p-value.

Figure II.D.2-21 Lognormal Probability Plot of Granular Dermal UE Data (MRID 45333401)



For the granular dermal UE dataset, 5 out of 15 samples were reported as half the LOQ. The mean and standard deviation estimated for hand wand dermal UE dataset are based on maximum likelihood estimation (MLE) procedures assuming the dataset represents a sample from a censored lognormal distribution. Since all inhalation samples were either non-detect or less than the LOQ, half the LOQ (0.00001 mg/lb aihandled) was used as an estimate of inhalation UE.

7. Pet Collar Exposure

Transfer Coefficient Data

Study Summaries

MRID 44658401 (Carbaryl Dog Groomer Study): The data collected reflect the dermal and respiratory exposure of commercial pet groomers applying the end use product, Adams® Carbaryl Flea and Tick Shampoo containing 0.50 percent carbaryl. In this study, applications of Adams® Carbaryl Flea and Tick Shampoo were made by professional pet groomers to 8 dogs at 2 sites in Georgia. A total of 16 replicates were monitored for dermal and inhalation exposure. Eight dogs of various sizes and hair lengths were shampooed during each replicate. Dermal exposure was monitored with face and neck swabs, 100 percent cotton union suit dosimeter worn underneath a short-sleeved t-shirt, long pants and a 65/35 polyester cotton long-sleeved smock (i.e., represents a short-sleeved shirt under a long-sleeved coat/smock). Hand exposure was quantified using handwash rinses (no protective gloves were worn). Inhalation exposure was monitored using personal air pumps with XAD2 resin tubes.

The dogs were wetted, shampooed to a lather (lather remained on dogs for 5 minutes) and rinsed. After completing 8 dog shampoos the dosimeters were collected. Face/neck swabs and 2 hand rinses were performed along with collection of the 100 percent cotton union suit.

Table II.D.2-24 TC Data Used for Pet Collar Scenario (Empirical Distribution)1

Groomer µg exposure	Duration: hours	µg/hour	ai deposited µg/cm^2*	Dislodged: 2.97 % efficiency assumed µg/cm^2	Transfer Coefficient (adults) cm^2/hour	Transfer Coefficient (children) cm^2/hour /3
8796	2.88	3054	37.5	1.114	2742	1016
6199	2.58	2403	31.0	0.921	2610	967
1408	3.07	459	18.6	0.552	831	308
2914	2.48	1175	36.4	1.081	1087	403
5667	3.08	1840	32	0.950	1936	717
2527	3.18	795	19	0.564	1409	522
2,348	2.93	801	15.9	0.472	1696	628
2961	2.72	1089	7.75	0.230	4731	1752
1135	4.03	282	14.8	0.440	642	238
14872	3.88	3833	28.8	0.855	4481	1660
1026	3.17	324	16.6	0.493	657	243
13490	4.05	3331	56.98	1.692	1968	729
4275	4.92	869	25	0.743	1170	433
4461	3.45	1293	42.25	1.255	1030	382
1511	3.03	499	8.87	0.263	1894	702
777	3.00	259	48.6	1.443	179	66
				Average	1817	673

1 Source Carbaryl Groomer Exposure Study (activity - wash/dip/groom). Each vet tech treated/handled 8 dogs: held small dogs w/arms and torso; some dogs climbed on person's shoulders while grooming etc.

2 Average transfer efficiency 2.97% =(powder (0.62%) + aerosol (3.3%) +pump spray (5%))/3; .

3 The transfer coefficients derived from this study were adjusted by an allometric scaling factor based on the relative size of children to adults to derive an appropriate transfer coefficient for children Adult:Child surface area ratio - 2.7:1 (avg. Adult 3169: avg child 1174)

*The amount ai per dog was measured in the study along with the animal's weight. The suface areas of the dogs were estimated using an equation for estimating mammal surface area described in the Wildlife Exposure Factors Handbook.

8. Golf Course Exposure

Residue Data

Study Summaries

MRID 45114301 (Carbaryl Liquid Turf Transferable Residue Study): A TTR study was conducted at individual sites in three states using the ORETF roller sampling method. The data used in this assessment was from the Georgia site. Bermudagrass was the variety of turfgrass treated at the Georgia site. Field work took place over three week intervals at each site. Applications were made and samples were collected essentially in October of 1998 Georgia. Two applications were made 7 days apart at each site. All applications in this study were completed at a rate of 8.17 lb ai/acre. Applications were made with typical groundboom sprayers using approximately 55 and 31 gallons of water per acre, respectively. All applications were made using Dragon Sevin Liquid which is a flowable concentrate formulation that contains carbaryl at a nominal concentration of 21 percent by weight or 2 lb ai/gallon.

There was approximately from 1 inch up to 2.7 inches of irrigation water on the day of the final application. Additionally, on the day of the final application, rain was noted that ranged in accumulations of 0.36 inches. Mowing events were not noted in the data from the Georgia site. Triplicate TTR samples were collected using the ORETF roller method at 8 intervals out to 14 days after the last application. All but two samples were collected during the 1st week of the study. In all cases, residue levels exceeded the LOQ at 14 days after application.

Statistical Details

Turf transferable residues (TTR) values are assumed to degrade exponentially over time (i.e. degrade by a constant proportion for any given time interval). In order to estimate the initial TTR value (i.e. TTR value at day zero) and the half-life of the liquid formulation of Carbaryl, the natural logarithms of the 27 (3 samples X 9 days) individual TTR samples (Table II.D.2-25) from the Georgia site were linearly regressed on the day of sample collection. The form of the linear regression is given below.

$$\ln(y) = \beta_0 + \beta_1 t$$

The linear regression parameters were then used to calculate initial TTR value (**A_0**) and the half-life (**$T_{1/2}$**) using formulae given below.

$$A_0 = \exp(\beta_0)$$

$$T_{1/2} = -\frac{\ln(2)}{\beta_1}$$

Table II.D.2-25 Liquid Formulation TTR Data (MRID # 45114301) Used for Carbaryl Golf Scenarios

Day	TTR Values (mg/cm^2)
0	0.00130
	0.00122
	0.00152
0.5	0.00067
	0.00073
	0.00147
1	0.00041
	0.00042
	0.00047
2	0.00020
	0.00028
	0.00023
3	0.00014
	0.00027
	0.00050
5	0.00040
	0.00023
	0.00010
7	0.00011
	0.00013
	0.00031
10	0.00003
	0.00015
	0.00022
14	0.00007
	0.00002
	0.00015

Transfer Coefficient Data

Study Summaries

Ballee, 1990 (chlorothalonil TC data) and Moran et al., 1987 (flurprimidol TC data): The data used to derive transfer coefficients were based on two measurements of four individuals playing golf on two golf courses treated with chlorothalonil (Ballee, 1990), and the exposure of golfers (four volunteers) to flurprimidol (Moran et al., 1987). For both studies, an assumed transfer efficiency of 1% was used to calculate the transfer coefficients, since the studies were conducted using sprayable formulations.

Statistical Details

Distributional parameters were estimated for the adult TC transfer coefficient (TC) values (Table II.D.2-26) from the Ballee and Moran studies. TC values were expressed as square centimeters per hour. Adult TCs were assumed to be lognormally distributed (i.e. fitted with a lognormal distribution). For the TC dataset, the shape (α) and scale (β) lognormal parameters were estimated by calculating the mean and standard deviation of the natural logarithms (base *e*) of the TCs. Parametric estimates of the arithmetic mean (μ) and standard deviation (σ) of the lognormal distribution were then calculated based on the shape and scale parameter estimates. The formulae used to calculate the mean and standard deviation are given below.

$$\mu = \exp(\alpha + \tfrac{1}{2}\beta^2)$$
$$\sigma = \mu\sqrt{\exp(\beta^2) - 1}$$

The Shapiro-Wilk (S-W) normality test statistic was used to assess the lognormal assumption implicit in the parametric calculations of the mean and standard deviation. The mean, standard deviation, and p-value of the S-W statistic are provided in Table II.D.2-27. A small p-value indicates that logarithms of the TCs are not normally distributed, or equivalently, that the TCs are not lognormally distributed. For the adult TC dataset, the S-W p-value is greater than 0.05.

Table II.D.2-26 Liquid Formulation TC Data Used for Golf Scenarios

TC Values (cm^2/hr)
391
329
561
547
592
533
385
508
756
522
264
278

Table II.D.2-27 Lognormal Distribution of TCs Used for Golf Scenarios

Exposure Route	Population	Transfer Coefficient Distribution (cm^2/hr)	Shapiro-Wilk p-value
Dermal	Adult	LN(475, 158)	0.4068
NOTES: LN(μ, σ) represents a lognormal distribution with mean=μ and standard deviation=σ.			

Additionally, a probability plot was used to qualitatively assess the appropriateness of the lognormal assumption. Generally a probability plot displays the actual values of a dataset (represented as points) and their expected values (represented as a line) for the specified distribution. The closer the actual values are to their expected values (i.e. the more the actual values approximate a straight line), the more likely the dataset is of the specified distribution. The probability plot for the TC dataset is provided in Figure II.D.2-22. The probability plot indicates that the TC dataset is reasonably approximated by a lognormal distribution.

Figure II.D.2-22 Lognormal Probability Plot of Liquid Formulation TC Data Used for Golf Scenarios