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July 1995

Older Driver Perception-Reaction Time for Intersection Sight Distance and Object Detection

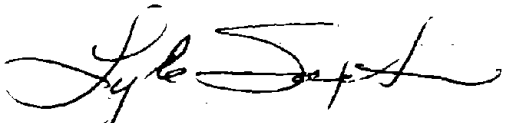
Volume II: Appendixes

U.S. Department of Transportation
Federal Highway Administration

FOREWORD

This report is one volume in a two-volume report which presents the results of a series of on-the-road studies investigating the perception-reaction times (PRT) of older and younger drivers. Perception-reaction time is an important component of highway design equations and was investigated with respect to stopping sight distance, intersection sight distance, and decision sight distance. Although differences were found in PRT between the age groups, the current American Association of State and Highway Transportation Officials (AASHTO) standards used in these equations were found to accommodate the 85th percentile for both older and younger drivers. Gap and lag acceptance was also investigated as a possible alternate design model for sight distance equations. Younger subjects accepted shorter gaps and rejected lags later than older subjects. The results of this study will be useful to researchers, planners, and others working in the area of highway and older driver safety.

Sufficient copies of these reports are being distributed to provide a minimum of two copies to each Federal Highway Administration regional and division office, and five copies to each State Highway Agency. Direct distribution is being made to division offices.



Lyle Saxton, Director
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Technical Report Documentation Page

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15. Supplementary Notes

We acknowledge the helpful cooperation of Mr. Robert Herstein and the State Highway Administration of the Maryland Department of Transportation for providing us with access to the unopened roadway section used in the SSD experiment.

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16. Abstract

Four on-road experiments investigated whether the assumed values for driver perception-reaction time (PRT) used in AASHTO design equations adequately represent the range of actual PRT for older drivers. The Case III (stop controlled) intersection sight distance (ISD) experiment found that older drivers did not have longer PRT than younger drivers; 85th percentile PRT closely matched the AASHTO design equation value of 2.0 s. In the stopping sight distance (SSD) experiment, involving brake reaction times to an unanticipated event (crash barrel suddenly rolling toward roadway), there were apparent differences in the distribution of PRT among age groups. Younger drivers accounted for most of the fastest PRT, but there were no age differences in the 50th or 85th percentiles. All observed PRT were encompassed by the current AASHTO design value of 2.5 s. The decision sight distance (DSD) experiment measured when drivers recognized the need to make a lane change maneuver, from the first visibility of the roadway cue used by the driver. Although observed DSD values were generally longer with increasing driver age, the 85th percentile PRT for all age groups were well below AASHTO design assumptions. The final experiment collected judgments about the acceptability of gaps and lags in traffic. Younger subjects accepted shorter gaps and rejected lags later than older subjects. Based on these findings, and consideration of the implications of changes in PRT for sight distance requirements, no changes to design PRT values, based on older driver performance, were recommended for ISD, SSD, or DSD. Alternative models for ISD, based on gap acceptance or lag rejection, were explored. Based on limited data, it is not clear whether these models offer any significant benefits to the current AASHTO model.

This report is the second of a two-volume report. The first report is FHWA-RD-93-168 (Vol. I) Final Report.

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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
	LENGTH			
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
	AREA			
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yards	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
	VOLUME			
fl oz	fluid ounces	29.57	milliliters	ml
gal	gallons	3.785	liters	l
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
NOTE: Volumes greater than 1000 l shall be shown in m^3.				
	MASS			
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg
	TEMPERATURE (exact)			
°F	Fahrenheit temperature	5(F-32)/9 or (F-32)/1.8	Celcius temperature	°C
	ILLUMINATION			
lc	foot-candles	10.76	lux	l
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
	FORCE and PRESSURE or STRESS			
lbf	poundforce	4.45	newtons	N
psi	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
	LENGTH			
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
	AREA			
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	ac
ha	hectares	2.47	acres	mi^2
km^2	square kilometers	0.386	square miles	
	VOLUME			
ml	milliliters	0.034	fluid ounces	fl oz
l	liters	0.264	gallons	gal
m^3	cubic meters	35.71	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
	MASS			
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg	megagrams	1.103	short tons (2000 lb)	T
	TEMPERATURE (exact)			
°C	Celcius temperature	1.8C + 32	Fahrenheit temperature	°F
	ILLUMINATION			
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m^2	0.2919	foot-Lamberts	fl
	FORCE and PRESSURE or STRESS			
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	psi

* SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.

(Revised August 1992)

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INTRODUCTION

This volume of appendixes is a companion report to Volume I: *Older Driver Perception-Reaction Time for Intersection Sight Distance and Object Detection*. Volume I describes the entire project, presents the primary experimental findings, and discusses the implications of the results. This volume provides supporting information and additional detail for the four experiments in the form of procedures, site characteristics, or additional statistical findings.

Appendix A provides information for the Case III intersection perception-reaction time (PRT) experiment.

Appendix B provides information for the stopping sight distance PRT experiment.

Appendix C provides information for the decision sight distance PRT experiment.

Appendix D provides information for the gap/lag acceptance experiment.

APPENDIX A. CASE III INTERSECTION PERCEPTION-REACTION TIME (PRT) EXPERIMENT

INSTRUCTIONS TO SUBJECTS

You are going to be driving your car in your normal manner, and I will be your passenger. I will be telling you where to drive, and every so often, when we stop at a stop sign, you will have to make some ratings concerning the roads you drove on. Before I explain how we will do this, let me tell you about the video camera system.

In order to have a visual record of our trip, and to allow us to compute trip times and driving speeds, we need to videotape the view from the car while you drive. We do this by installing a set of cameras on a roof rack. [point out cameras, rack] As you can see, this is a system that just hooks onto your car using a ski rack, which will not mar your car in any way. There are three cameras here that show us the road scene ahead, and one micro camera which is pointed at you. The power for the system comes from this battery, which will be on the floor of your trunk. This TV and keyboard will allow me to control the video equipment and to enter information during our trip.

Now let me explain what you will be doing. You will drive in your normal manner along a route that I will direct you on. Just relax and drive as you usually do. Stay in the right lane unless I tell you otherwise. If there are any turns or lane changes to make, I will give you plenty of warning.

Every so often, you are going to make some judgments about the quality of the roads you have driven on. Often, when we come to a stop sign, we will use that as an opportunity for you to make your ratings. By "road quality" we mean your feelings about the smoothness of the ride, the ease of handling your vehicle, and the general comfort you feel as a driver. As you can see on this rating form, you will rate the road quality on a scale from 1 to 5. A "1" means the road quality is extremely poor; a "5" means the road quality is exceptionally good. Use numbers between 1 and 5 to rate roads that fall between these extremes.

We won't make these ratings every time we come to a stop, but often we will. Stop just as you normally would for any stop sign. If you are to make your ratings, I will tell you to do so. If I say "no ratings," just proceed on. Whenever you make your ratings, your judgments will only be about that part of the trip since the last time we stopped and made ratings. In other words, the trip will be broken up into segments, and each time you make the ratings, they will only be for that segment of the trip since the previous rating. Some segments will be long, others very short.

As you can see from the form, you will make three different ratings using the five point scale. The first rating is only for the best section of road you traveled during that part of the trip. The second rating is only for the worst section of road you traveled during that part of the trip. The third rating is for the average quality of the road over that entire segment of the trip. For each of these ratings, you will simply need to press one of the five buttons on the blue box which is attached to this clipboard [show them the clipboard and buttons]. For example, at the end of the first segment, you may feel that the best section was extremely

good, the worst section was extremely bad, and the segment was about average overall, so you would press the top, bottom, and middle buttons in succession to rate each of the factors. All of your ratings will be recorded automatically on the computer. If you make a mistake and wish to reenter your ratings, the computer will automatically ignore all but your last three entries for a given segment.

We will practice using the rating scales during a practice run. Do you have any questions about how to use them?

Now here is another important part of the procedure. I have to set up the recording equipment and begin timing the driving time each time we are ready to start the next segment of the trip. I will also have to tell you whether we will be turning or going straight ahead. For these reasons, it is important that you do not start driving until I give you the go-ahead. We will do this by using this button and light. When you finish the ratings, do not start driving or looking at the road. Instead, watch the light above the button. I will tell you whether we will be going straight, turning left, or turning right. Then when the light goes on, I have the equipment ready to start. As soon as you are ready, push the button. This will start the equipment recording again. As soon as you push the "ready" button, look up and check for traffic just as you normally would at any stop sign. Whenever it is safe, go ahead and start driving again.

We will begin with a short practice drive. This will get you familiar with the rating scales and using the "ready" button. Do you have any questions before we start?

Make your judgments about the roads you have driven since your last rating. The "quality" of the road refers to your feelings about the smoothness of the ride, the ease of handling your vehicle, and the general comfort you feel as a driver.

Press the corresponding rating buttons for the 3 ratings outlined below. Only the last 3 buttons you press will be recorded for the segment rating.

There are no right or wrong answers. It is your feelings about the road that matter.

****

1. Rate the quality of the best section of road for this part of the trip:

1	2	3	4	5
Extremely Poor Road Quality				Exceptionally Good Road Quality

2. Rate the quality of the worst section of road for this part of the trip:

1	2	3	4	5
Extremely Poor Road Quality				Exceptionally Good Road Quality

3. Rate the average quality for all the road sections for this part of the trip:

1	2	3	4	5
Extremely Poor Road Quality				Exceptionally Good Road Quality

POST EXPERIMENT QUESTIONNAIRE

NAME: _____ AGE: _____

GENDER ____ How many years have you been driving: _____

About how many times a week do you drive a car? *(please circle one)*

None *1-2* *3-5* *6-9* *10-15* *More than 15 trips per week*

If you have to hit the brakes in a sudden emergency, how does your break reaction time compare to:

(For EACH ROW, please check (√) the appropriate rating)

	Much Slower	*Some-what Slower*	*Slightly Slower*	*About the Same*	*Slightly Faster*	*Some-what Faster*	*Much Faster*
The average driver on the road							
Other drivers of about my age							
Myself 10-years ago							

If you come upon a complicated situation (freeway interchanges, construction zones, complex intersections, etc.) and have to make a decision about what lane to be in, how would you rate your decision time compared to:

(For EACH ROW, please check (√) the appropriate rating)

	Much Slower	*Some-what Slower*	*Slightly Slower*	*About the Same*	*Slightly Faster*	*Some-what Faster*	*Much Faster*
The average driver on the road							
Other drivers of about my age							
Myself 10-years ago							

How many traffic accidents have you been involved in over the past 3-years (whether you were at fault or not)? _____

Thank you for taking part in today's discussion group. If you are or might be interested in taking part in future projects, please write your phone number below.

Phone Number: (Area Code) _____

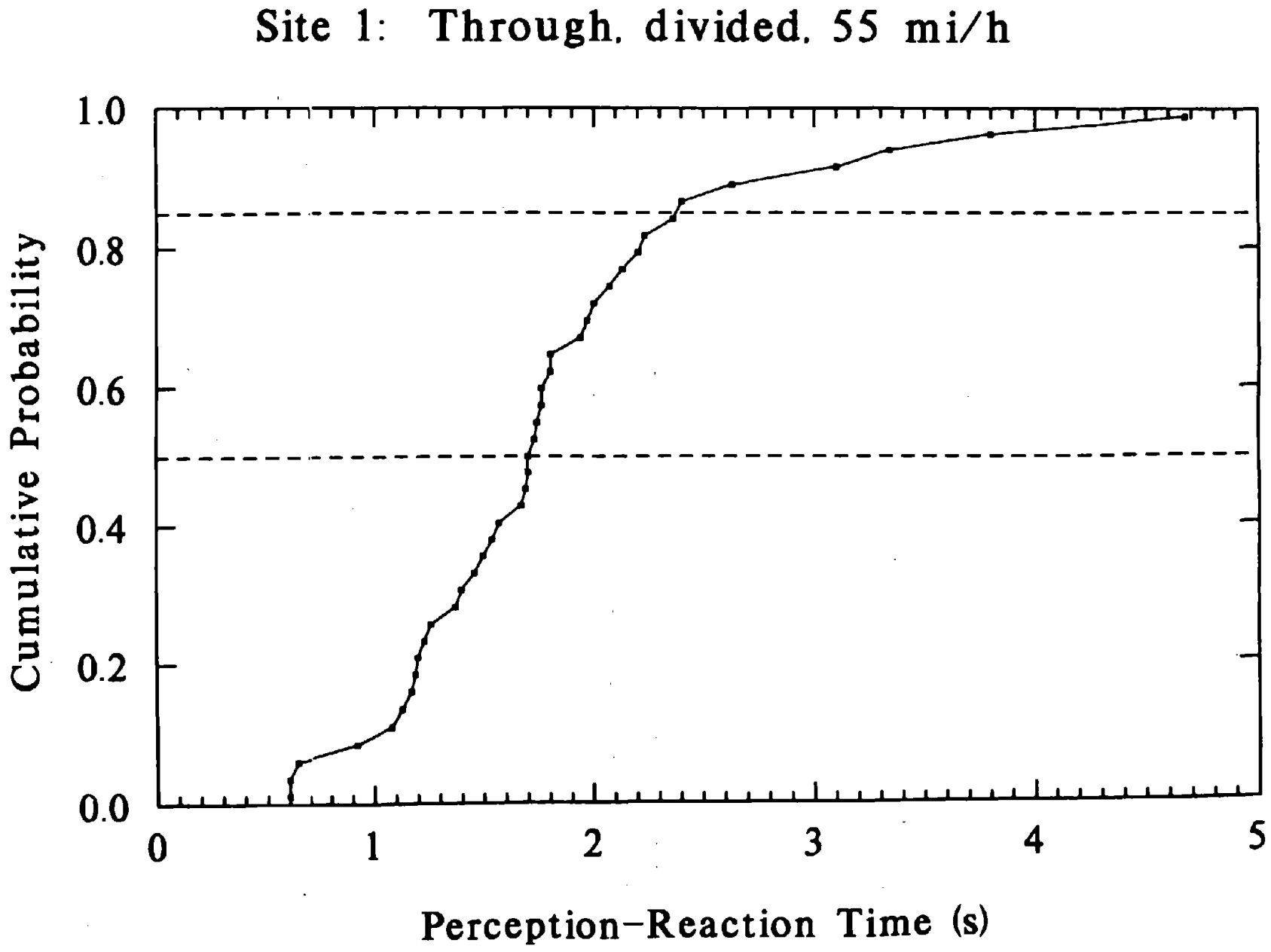
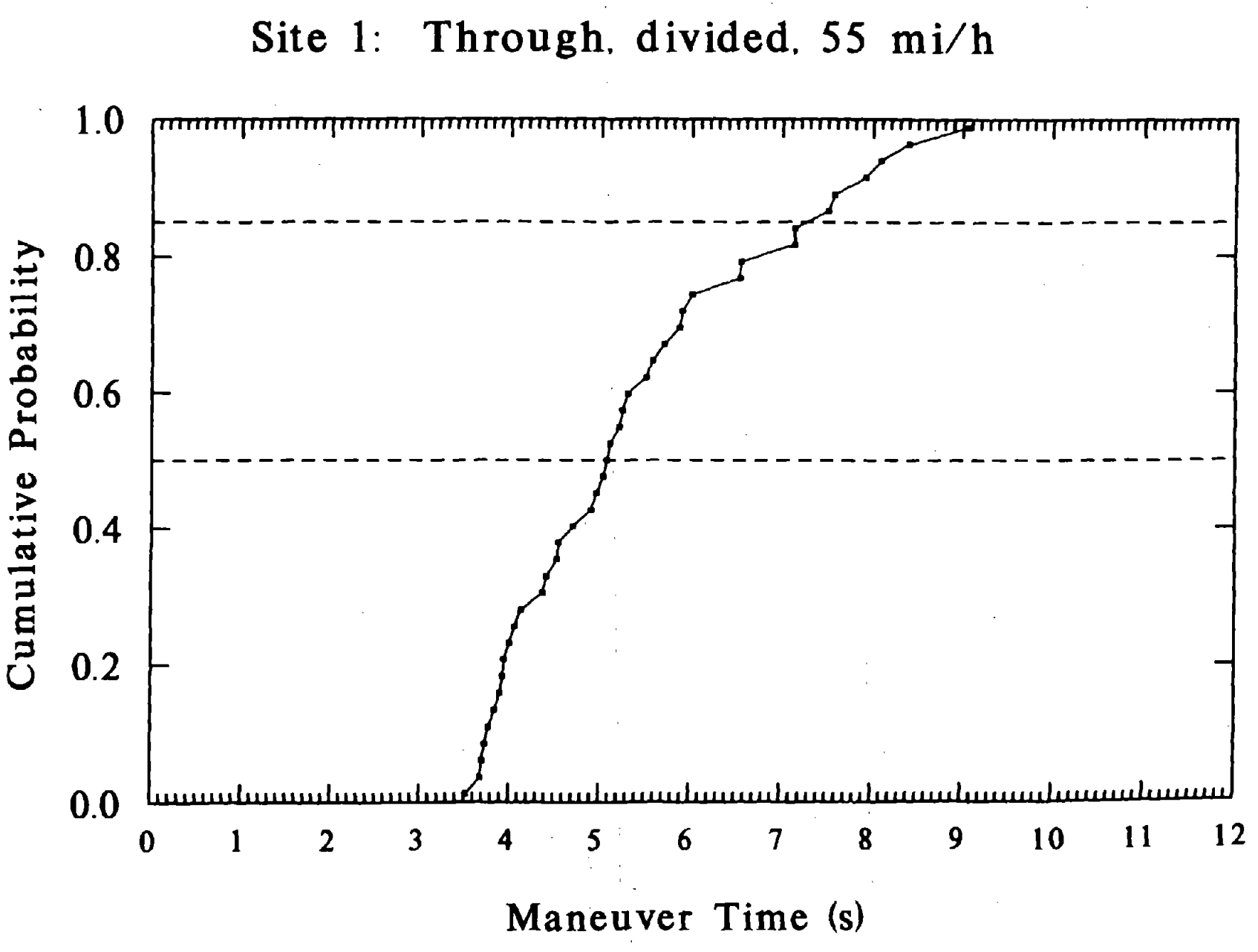


Figure 1. Cumulative frequency plots for site 1: through, divided, 55 mi/h, perception-reaction time(s).


Site 1: Through, divided, 55 mi/h
Cumulative Probability
1.0
0.8
0.6
0.4
0.2
0.0
0
1
2
3
4
5
6
7
8
9
10
11
12
Maneuver Time (s)

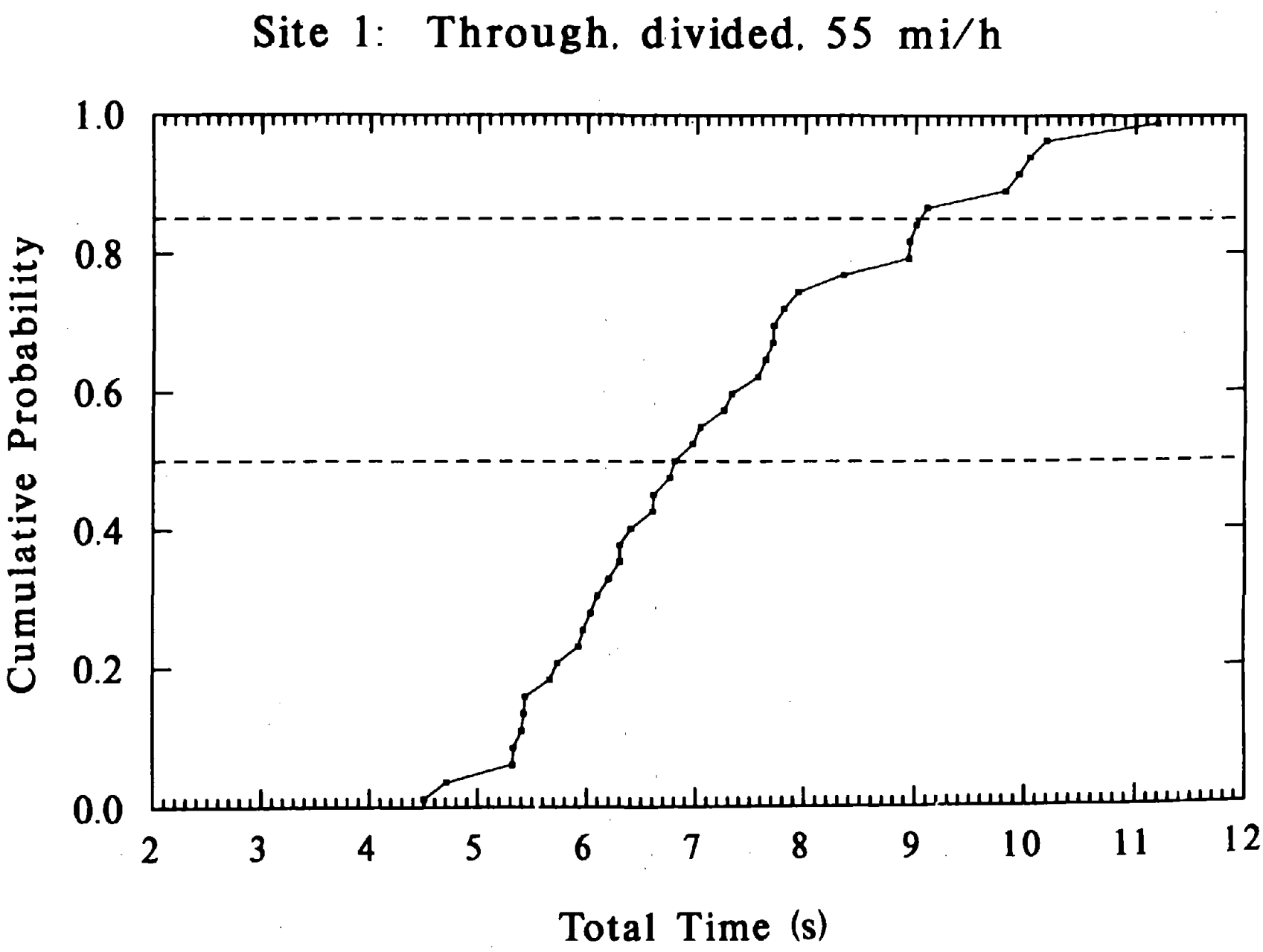


Figure 3. Cumulative frequency plots for site 1: through, divided, 55 mi/h, total time(s).

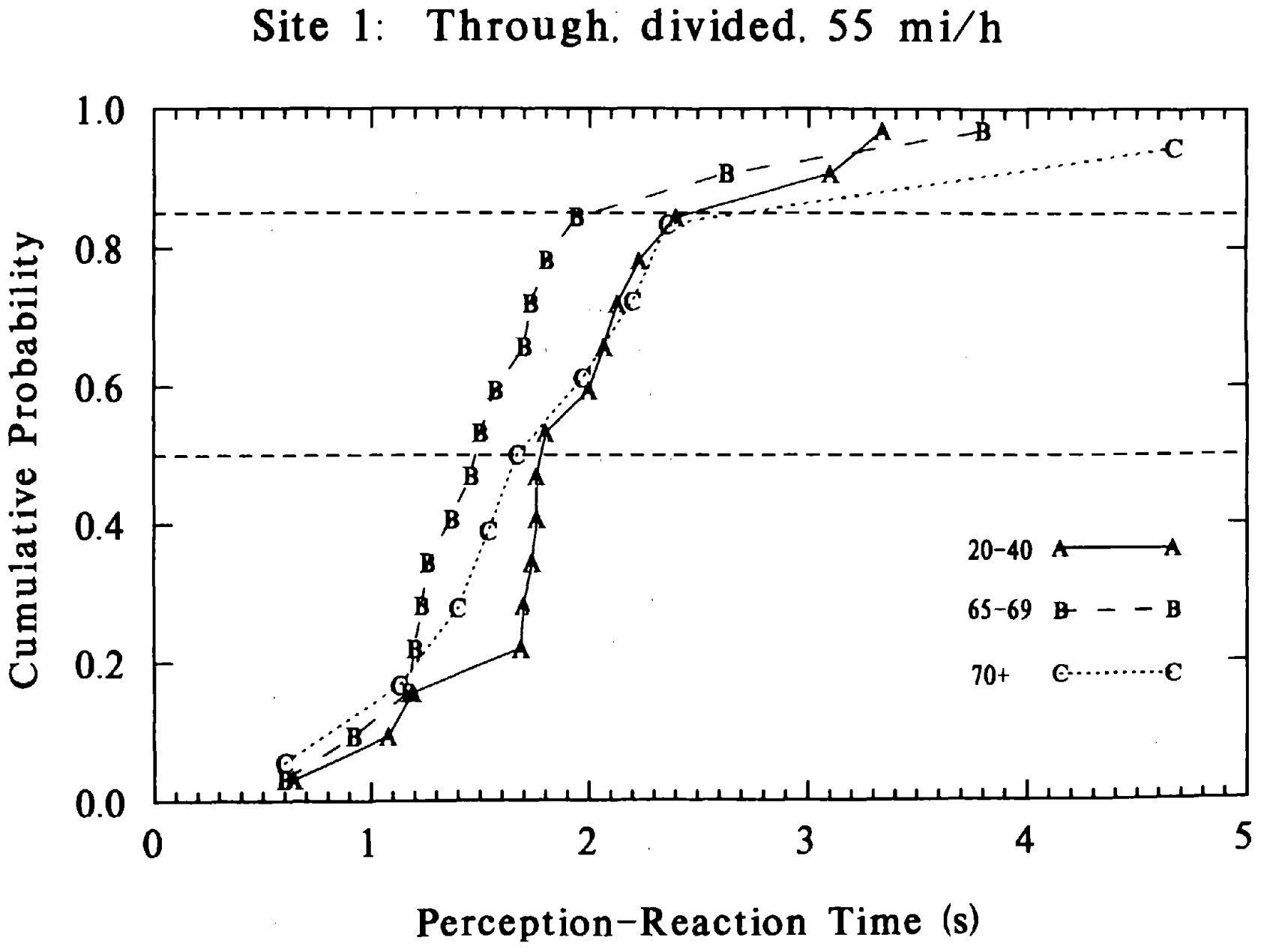


Figure 4. Cumulative frequency plots for site 1: through, divided, 55 mi/h, perception-reaction time(s), by age.

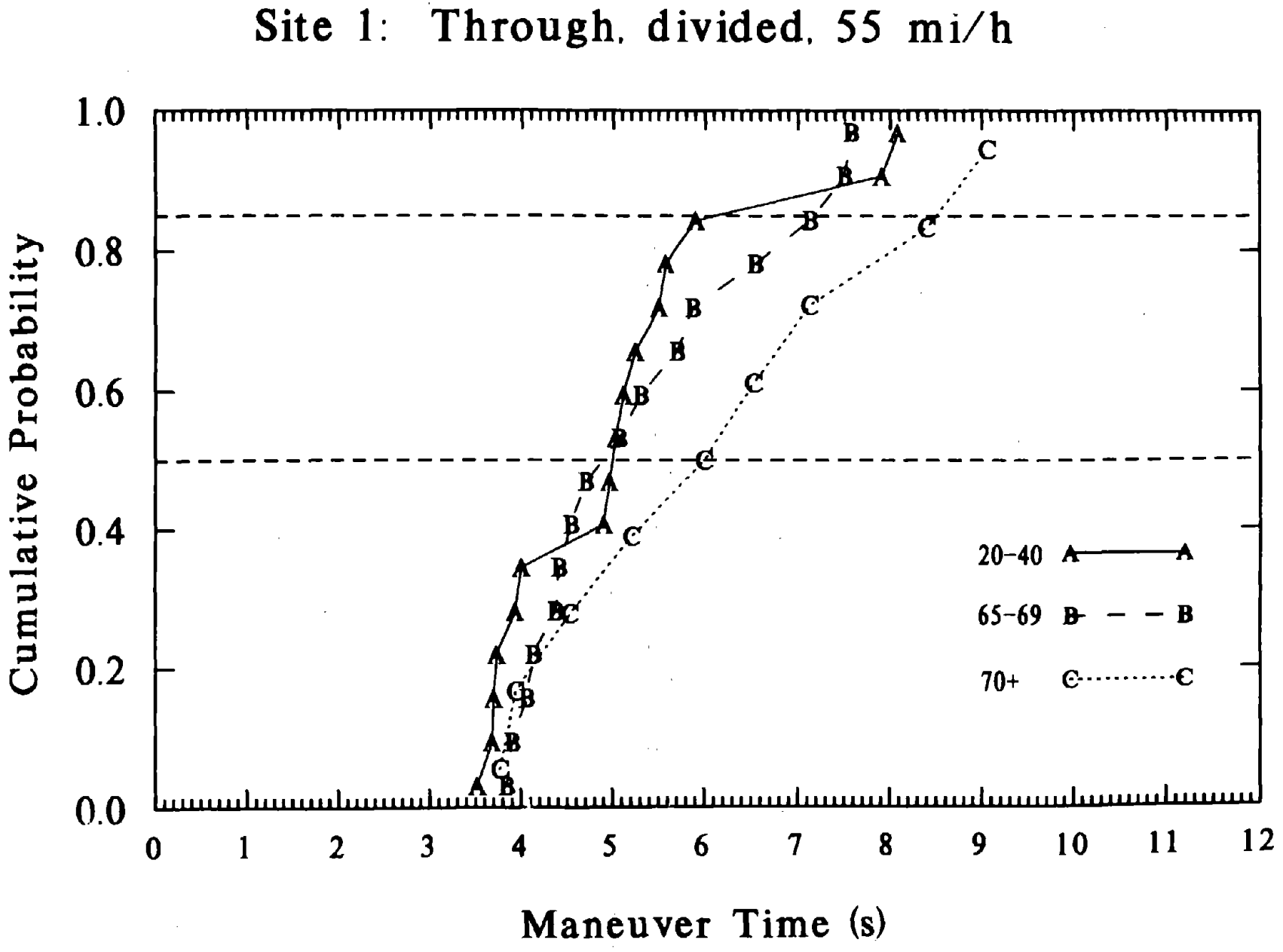


Figure 5. Cumulative frequency plots for site 1: through, divided, 55 mi/h, maneuver time(s), by age.

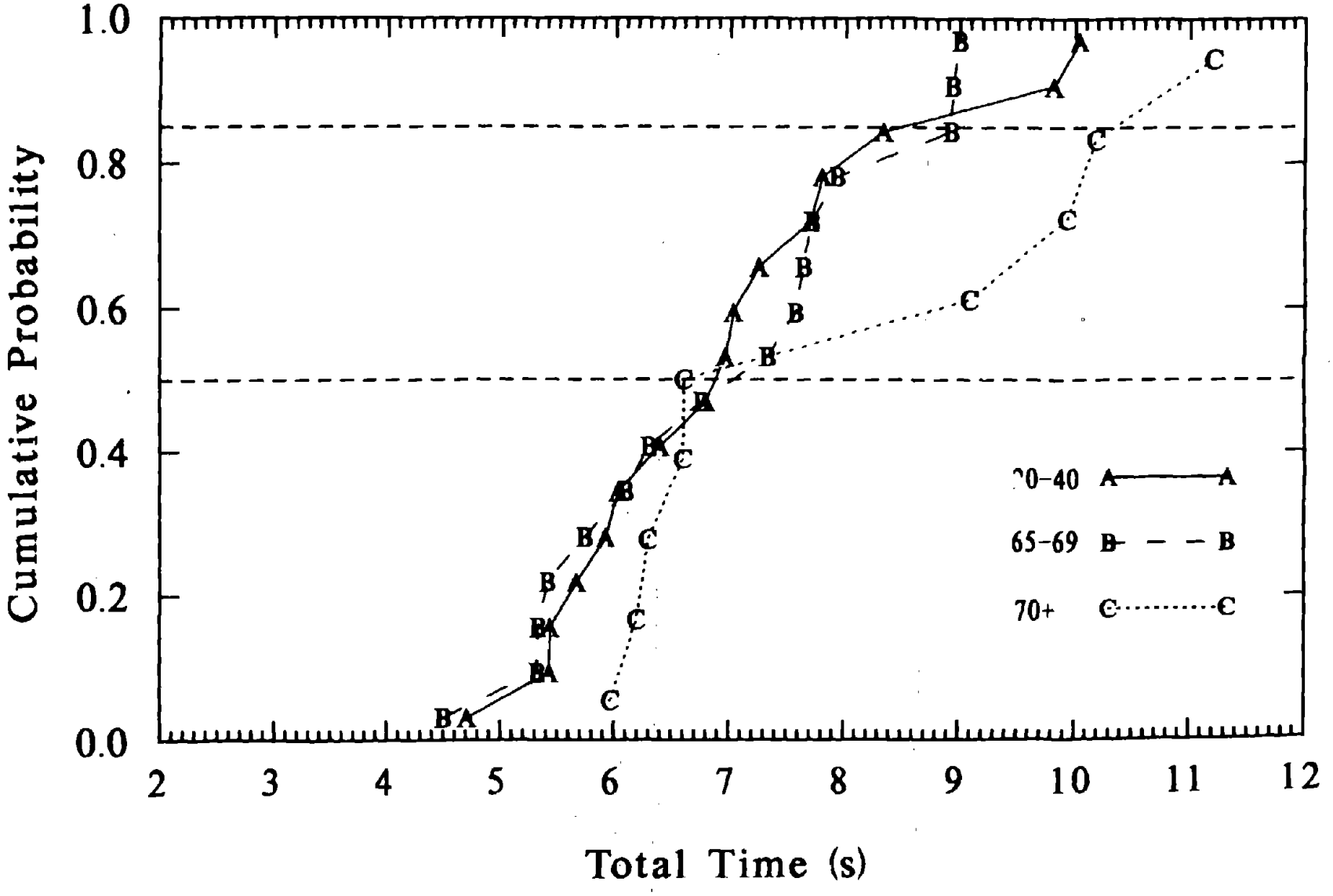


Figure 6. Cumulative frequency plots for site 1: through, divided, 55 mi/h, total time(s), by age.

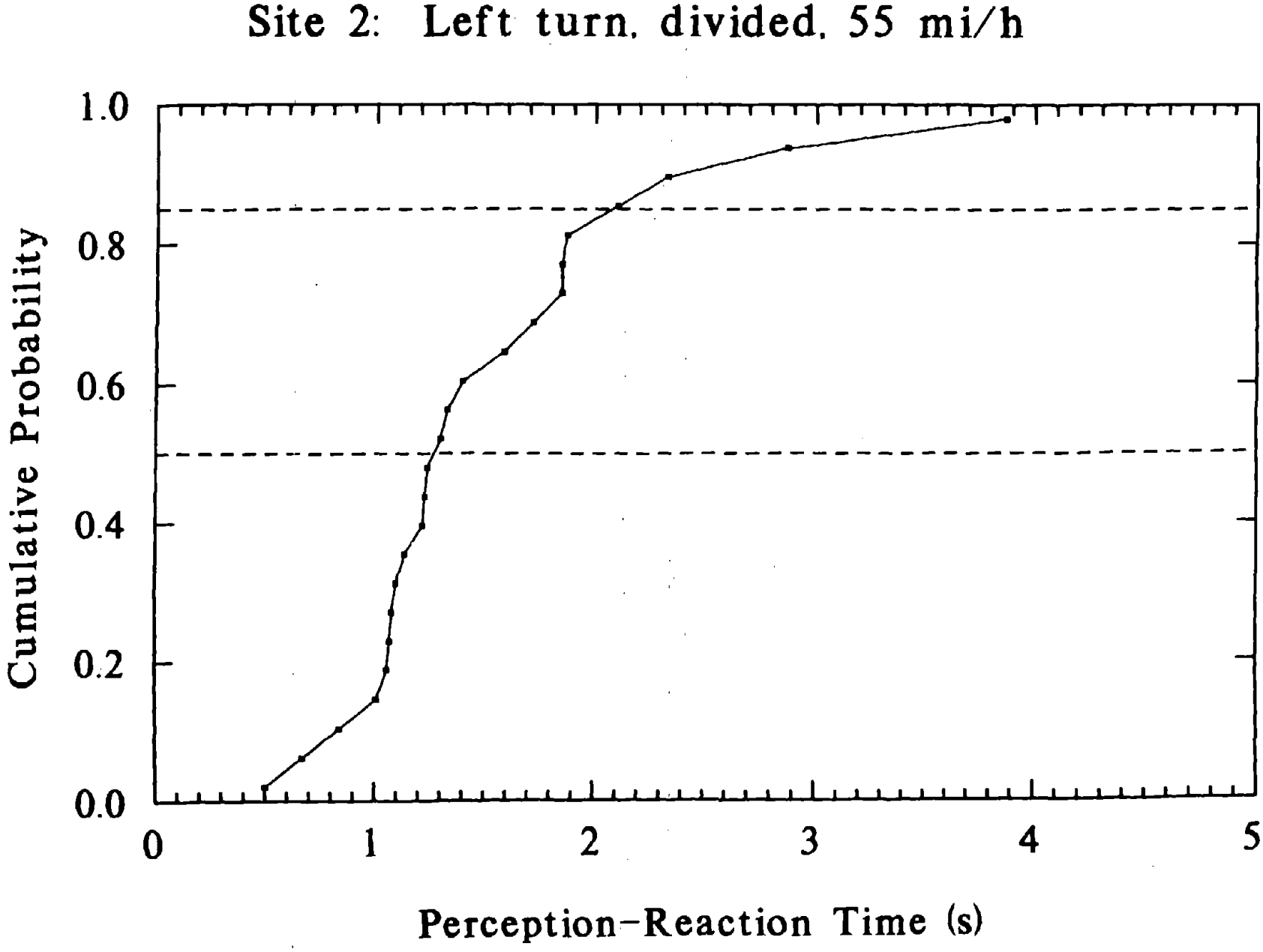
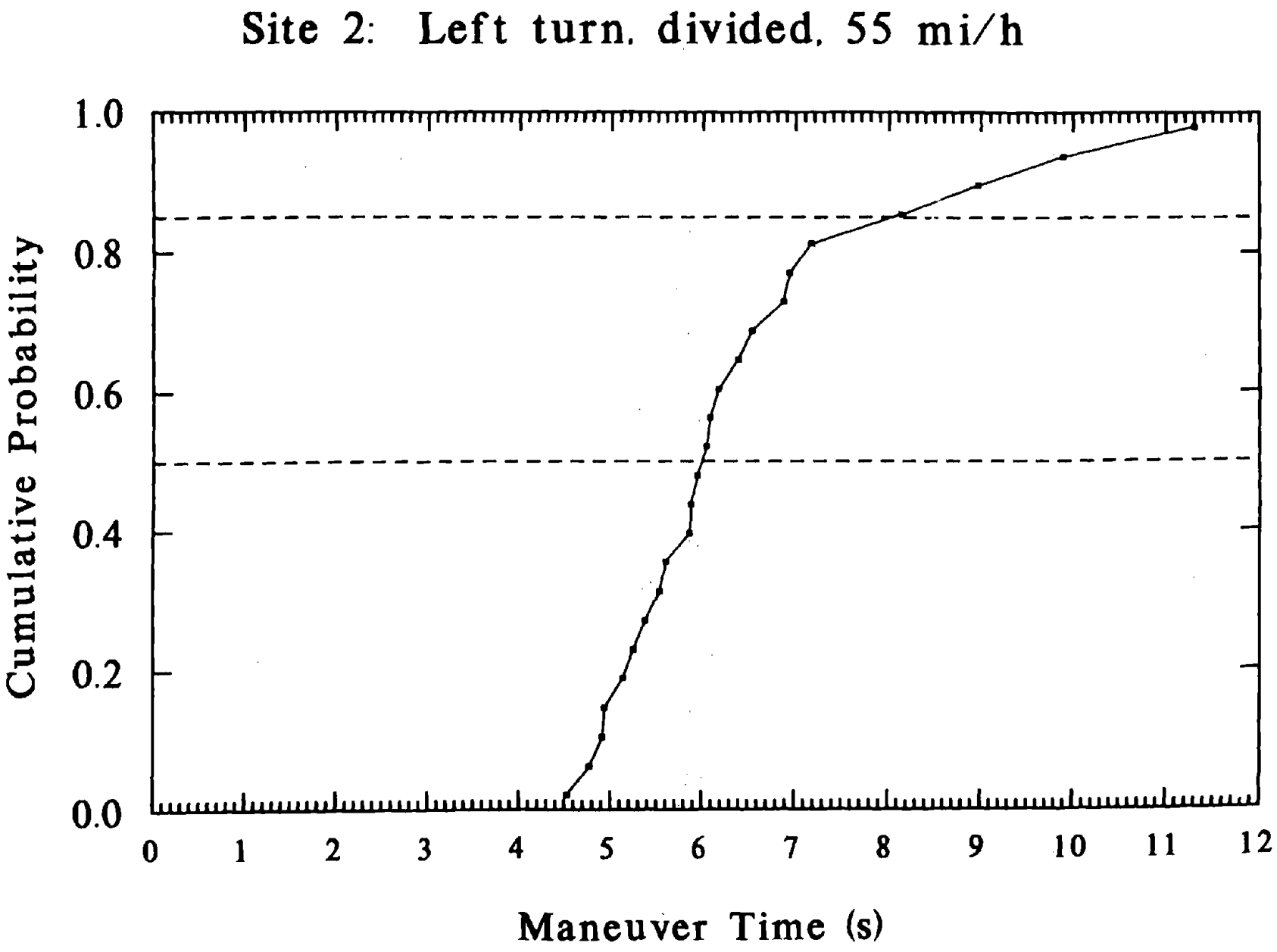


Figure 7. Cumulative frequency plots for site 2: through, divided, 55 mi/h, perception-reaction time(s).


Site 2: Left turn, divided, 55 mi/h
Cumulative Probability
1.0
0.8
0.6
0.4
0.2
0.0
0
1
2
3
4
5
6
7
8
9
10
11
12
Maneuver Time (s)

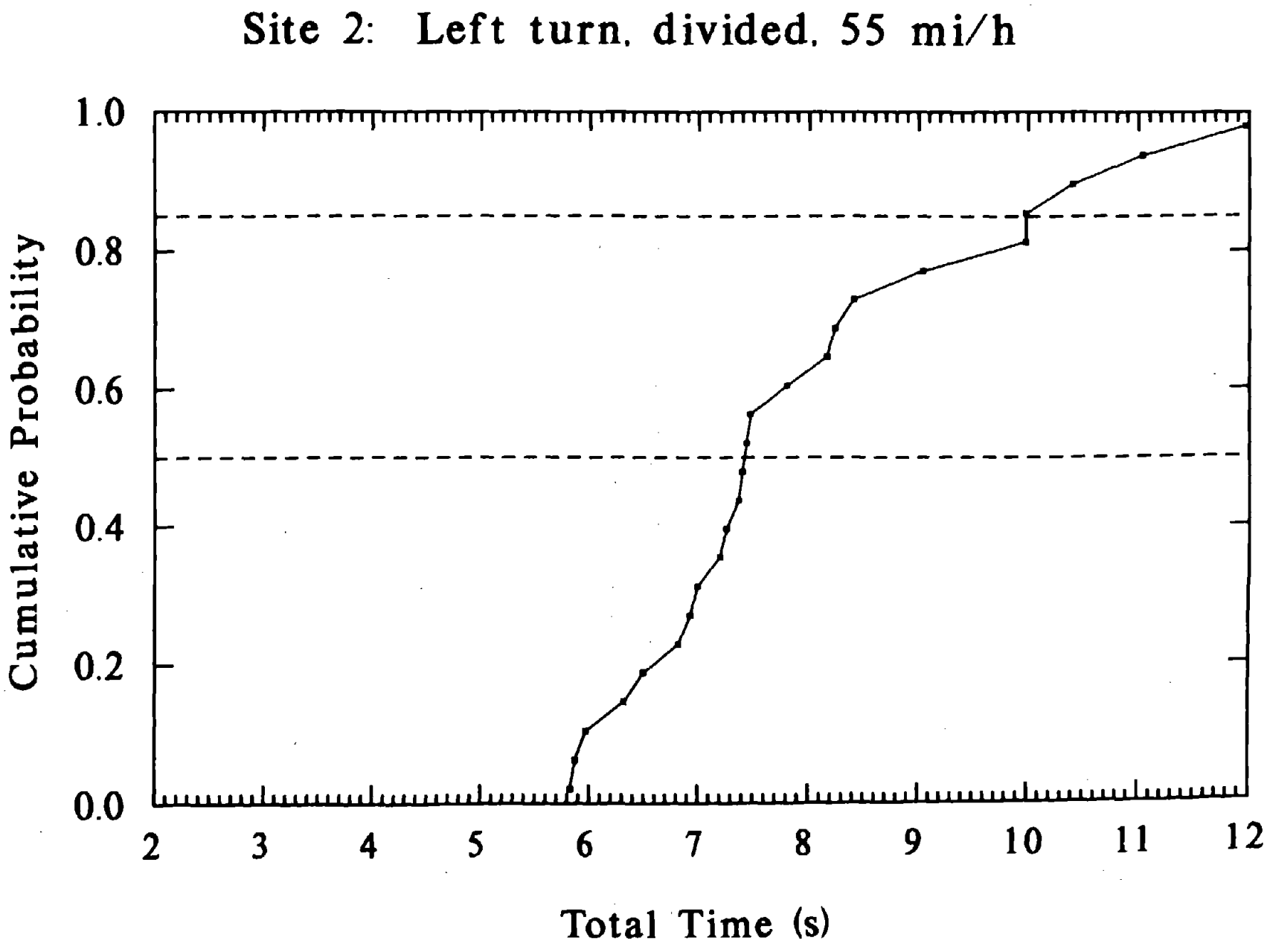


Figure 9. Cumulative frequency plots for site 2: through, divided, 55 mi/h, total time(s).

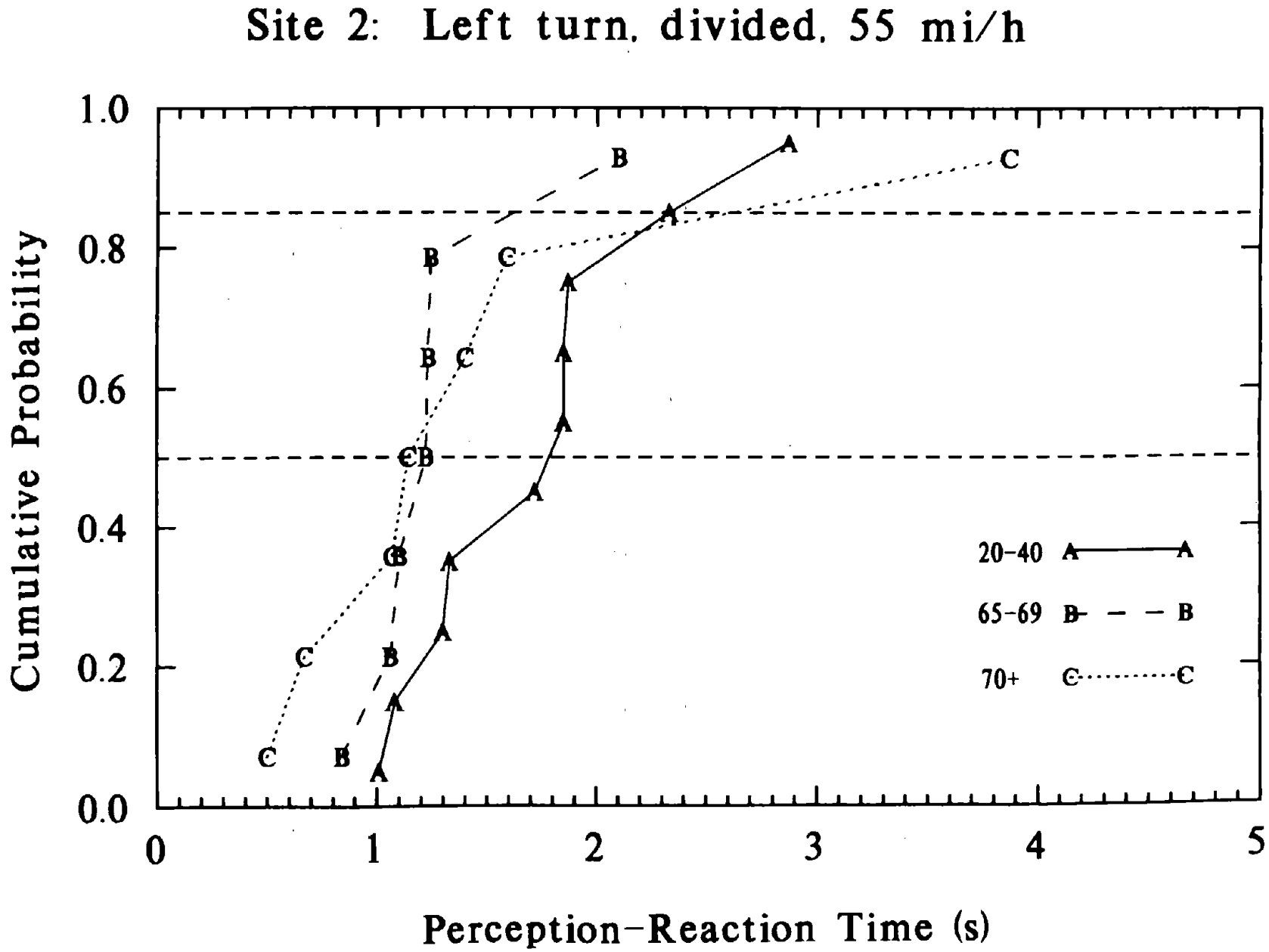


Figure 10. Cumulative frequency plots for site 2: through, divided, 55 mi/h, perception-reaction time(s), by age.

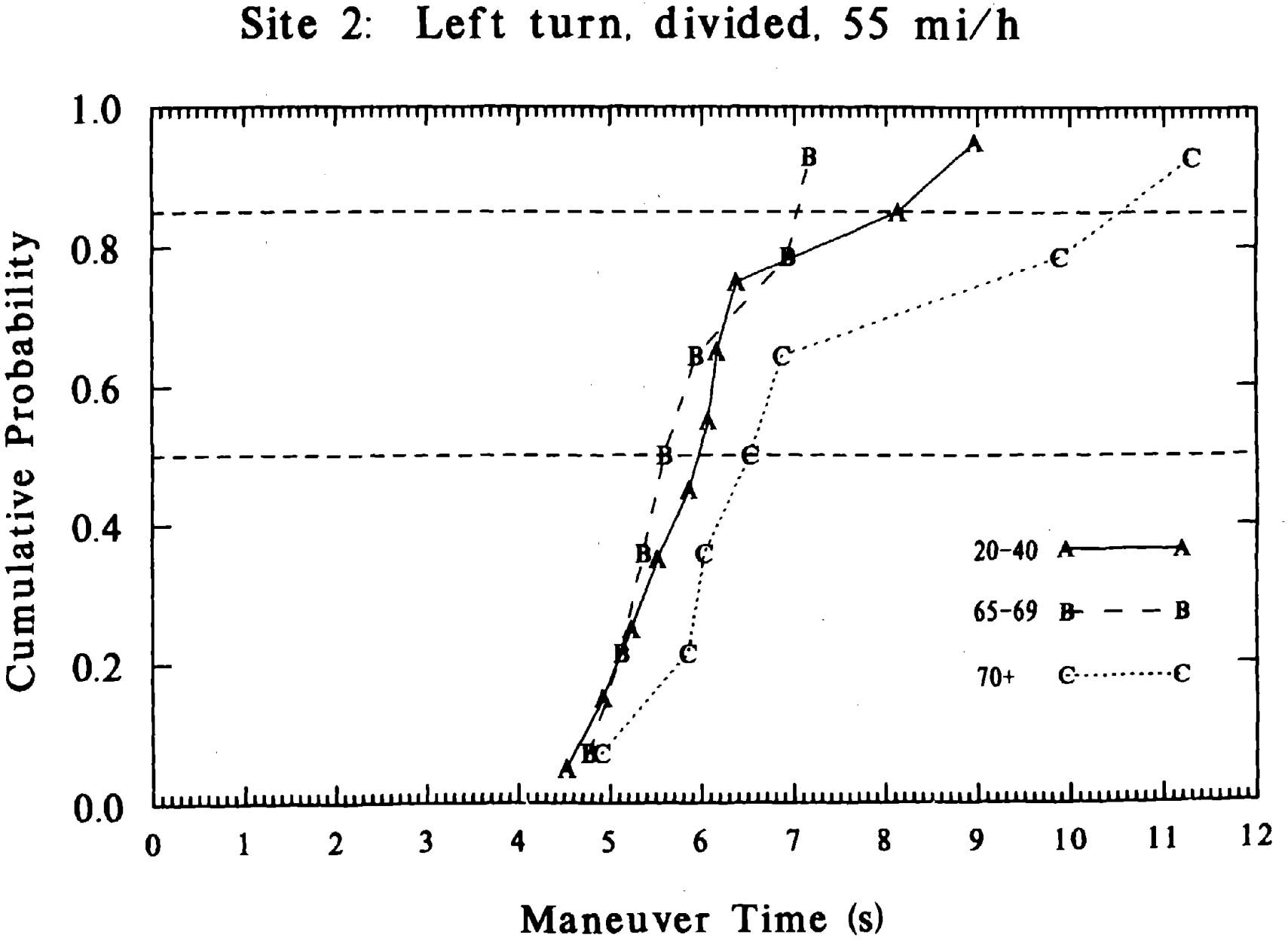


Figure 11. Cumulative trequency plots for site 2: through, divided, 55 mi/h, maneuver time(s), by age.

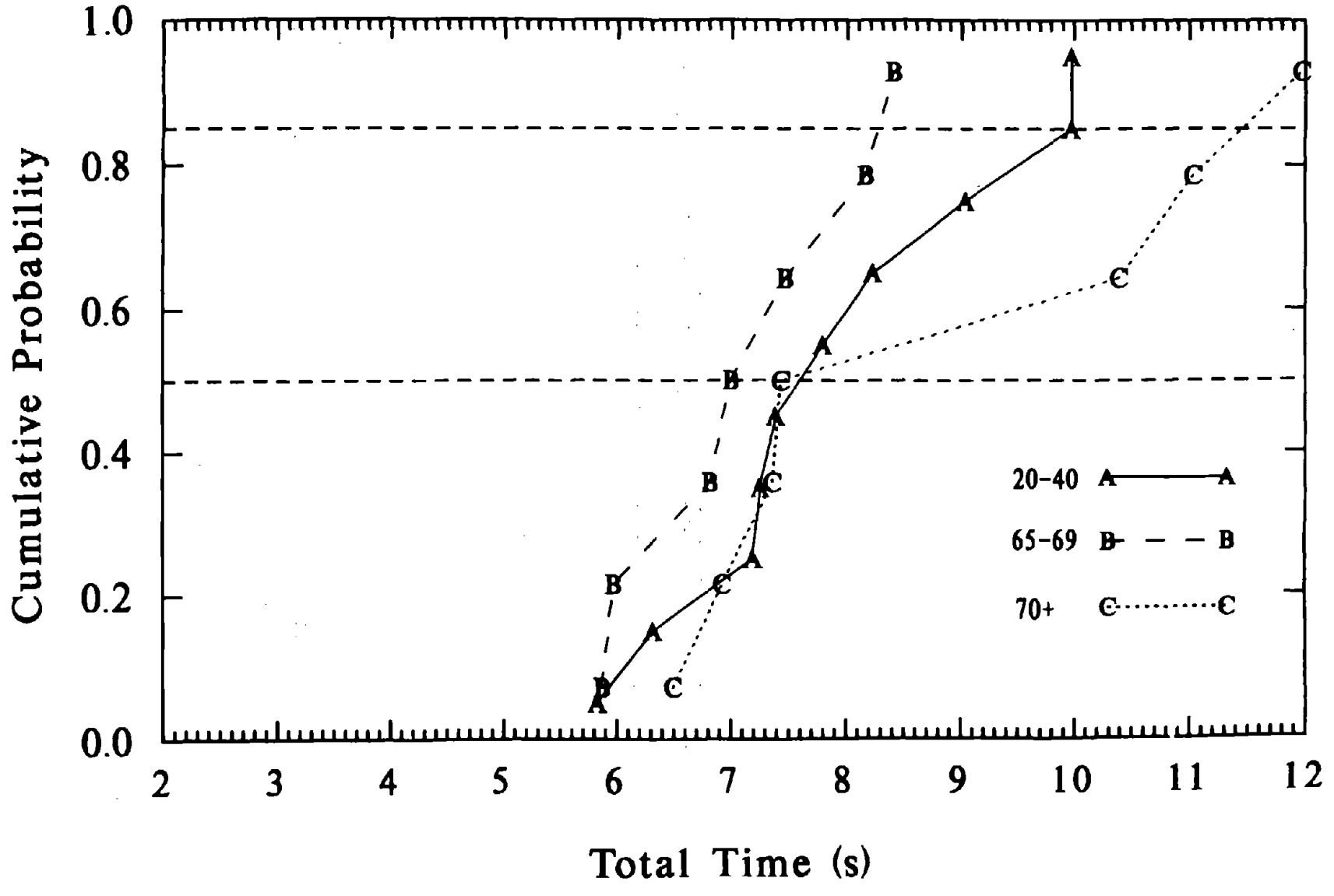


Figure 12. Cumulative frequency plots for site 2: through, divided, 55 mi/h, total time(s), by age.

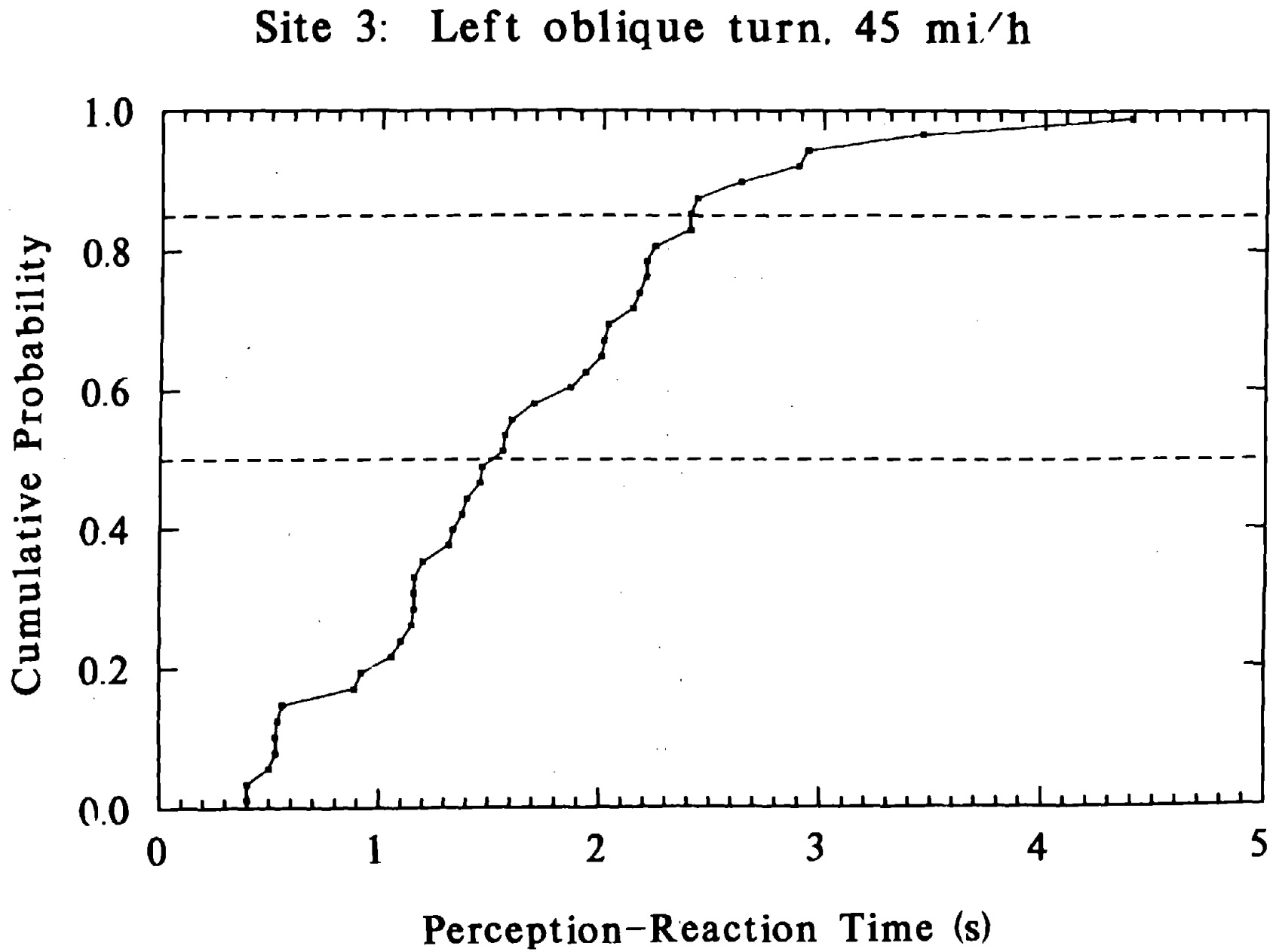


Figure 13. Cumulative frequency plots for site 3: through, divided, 55 mi/h, perception-reaction time(s).

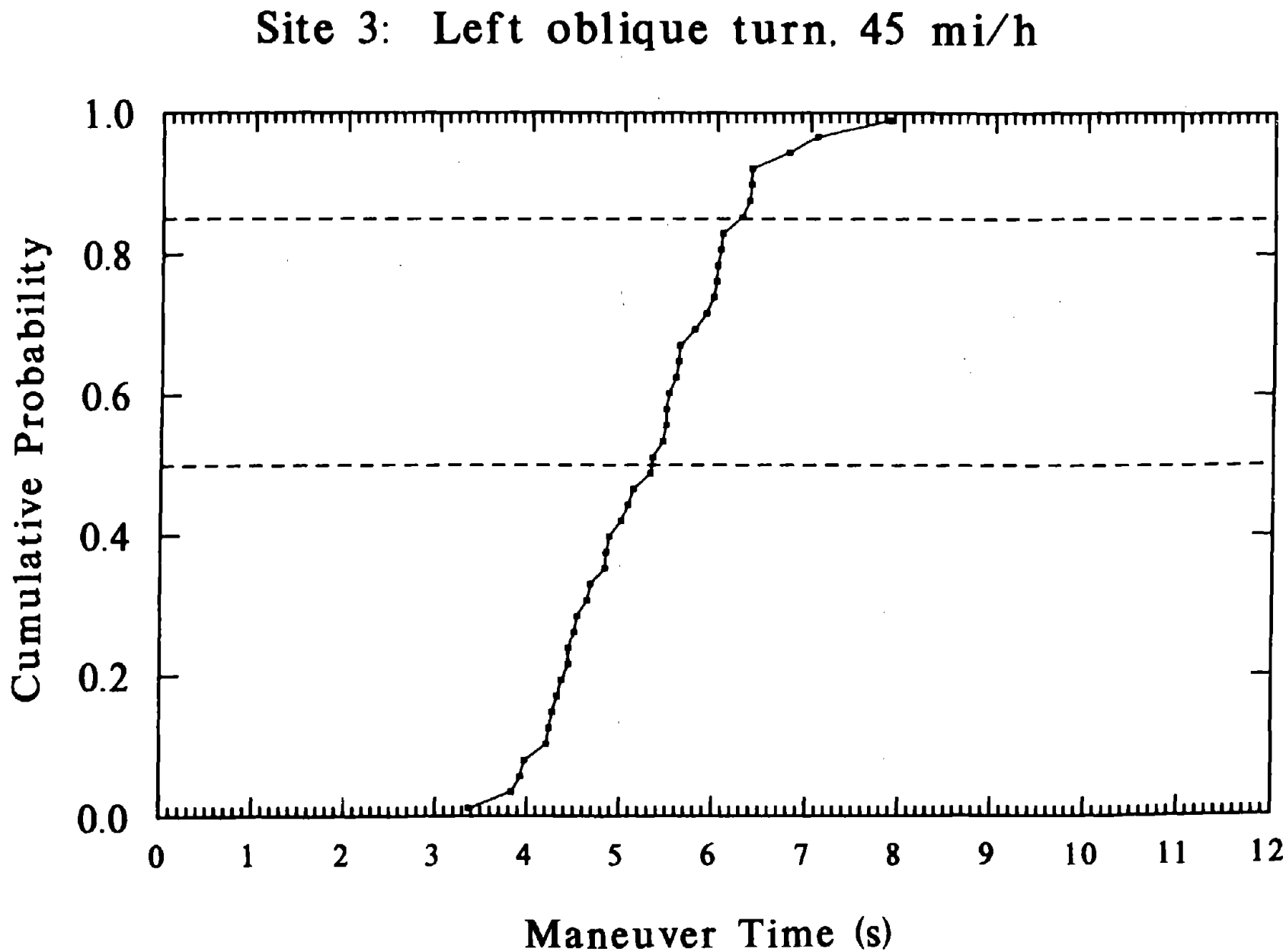


Figure 14. Cumulative frequency plots for site 3: through, divided, 55 mi/h, maneuver time(s).

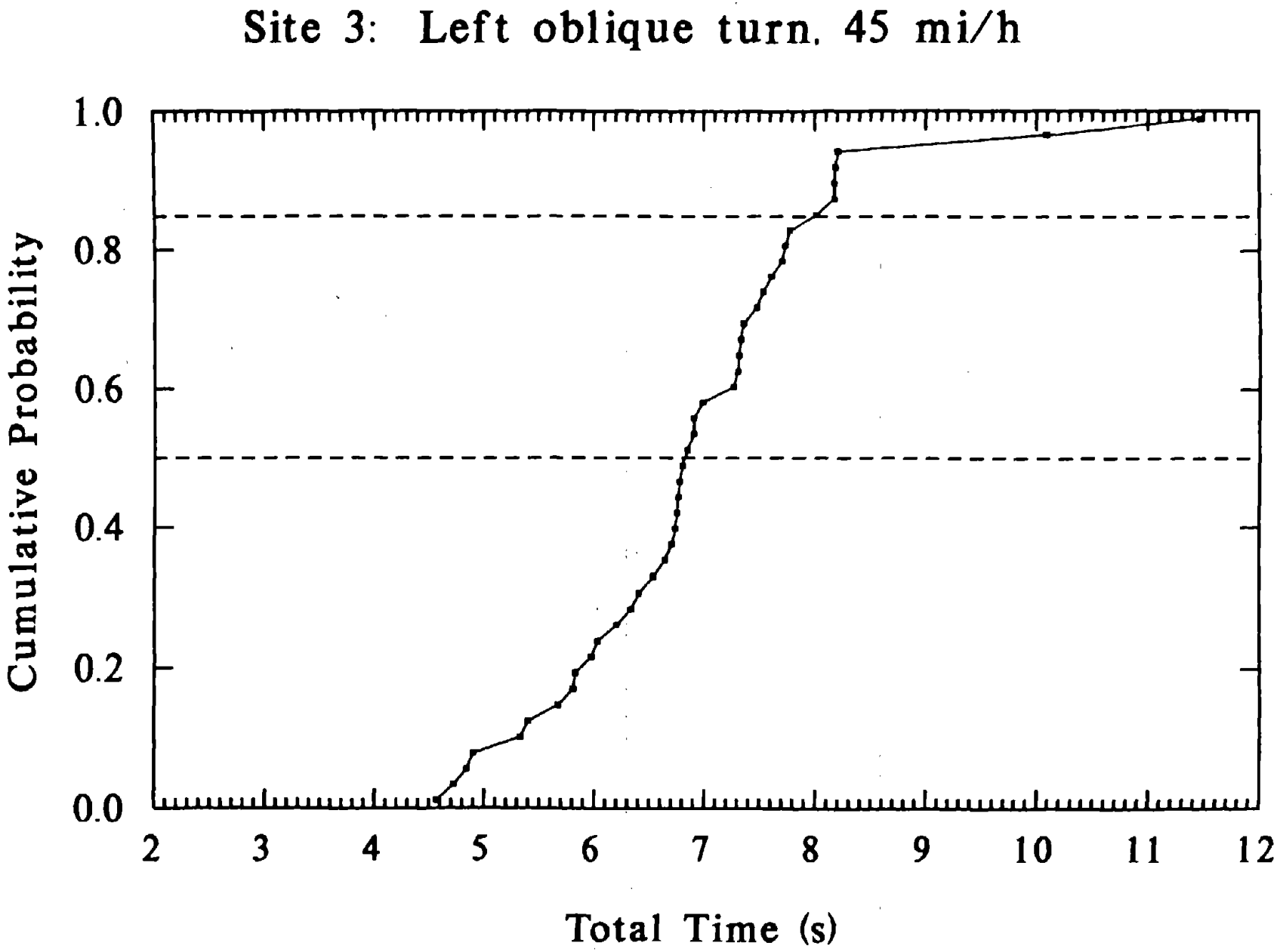


Figure 15. Cumulative frequency plots for site 3: through, divided, 55 mi/h, total time(s).

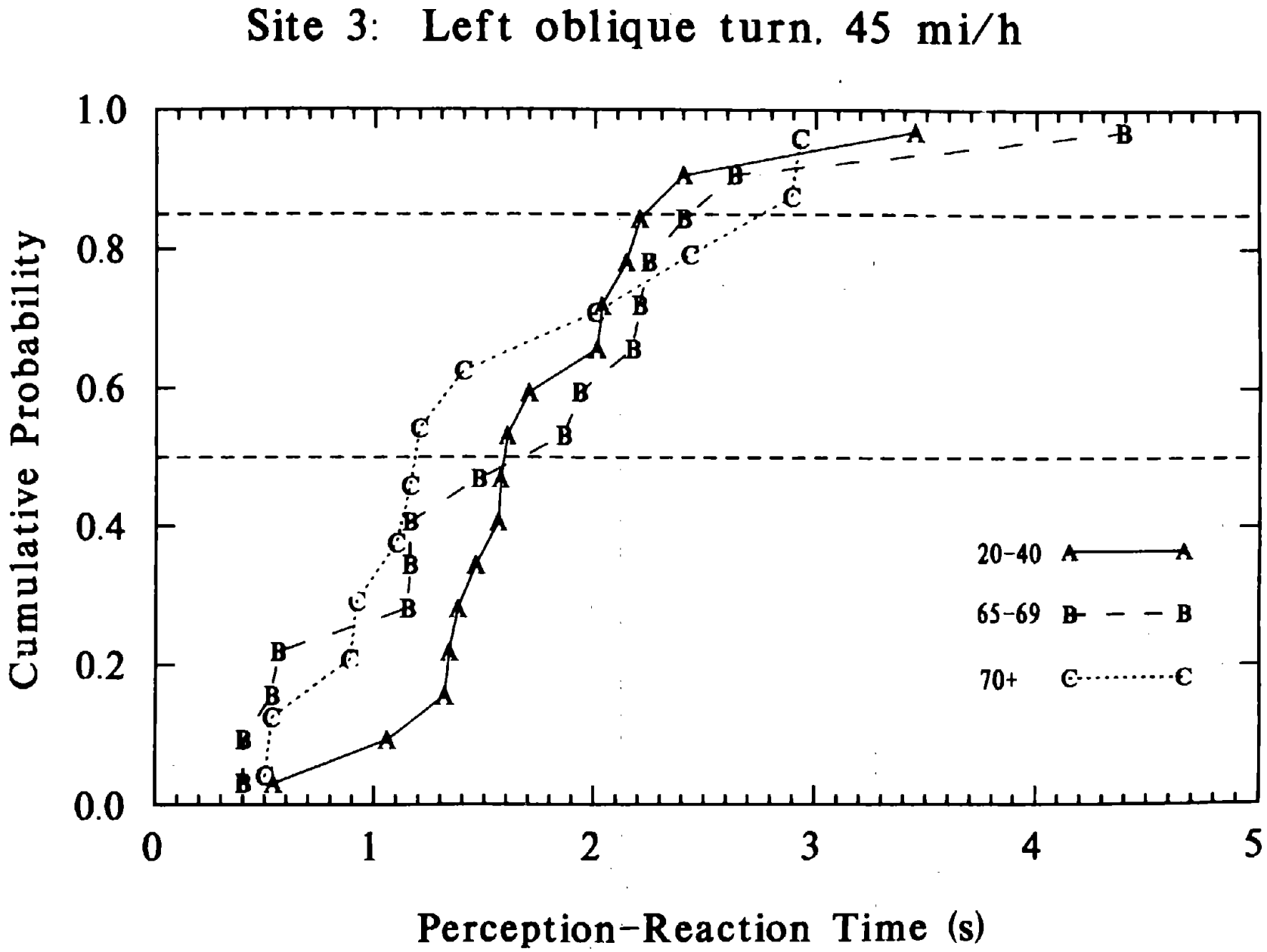


Figure 16. Cumulative frequency plots for site 3: through, divided, 55 mi/h, perception-reaction time(s), by age.

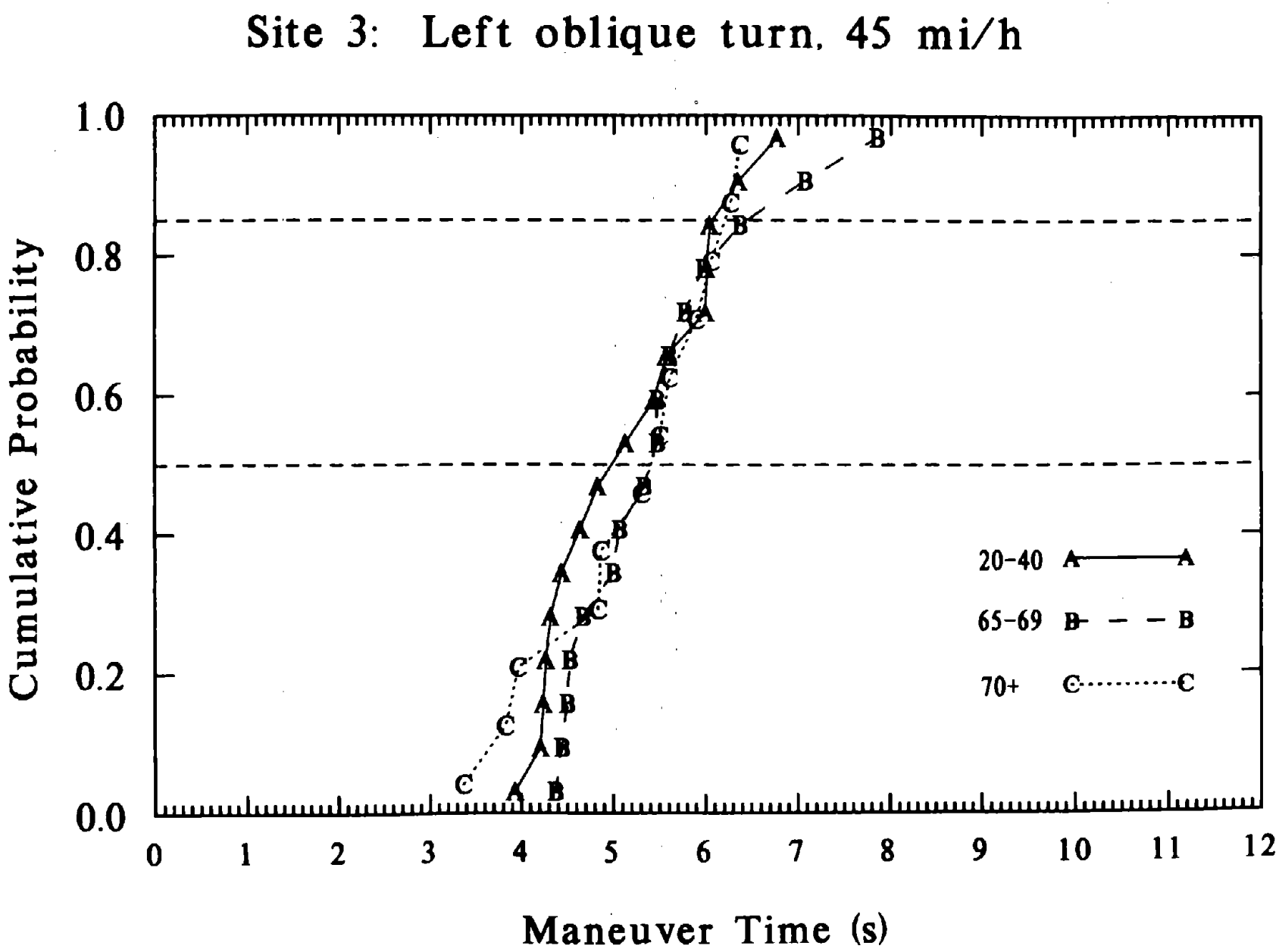


Figure 17. Cumulative frequency plots for site 3: through, divided, 55 mi/h, maneuver time(s), by age.

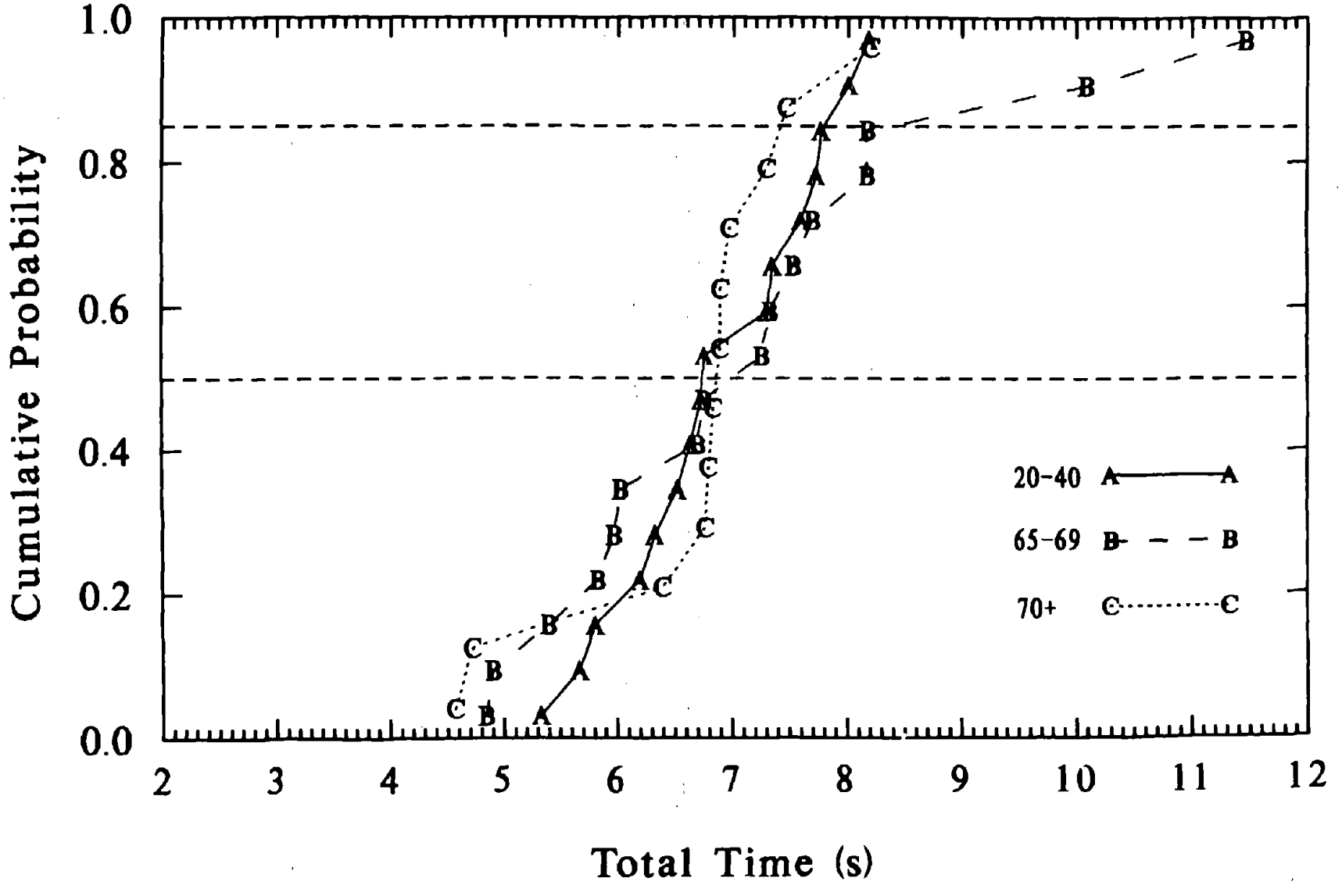


Figure 18. Cumulative frequency plots for site 3: through, divided, 55 mi/h, total time(s), by age.

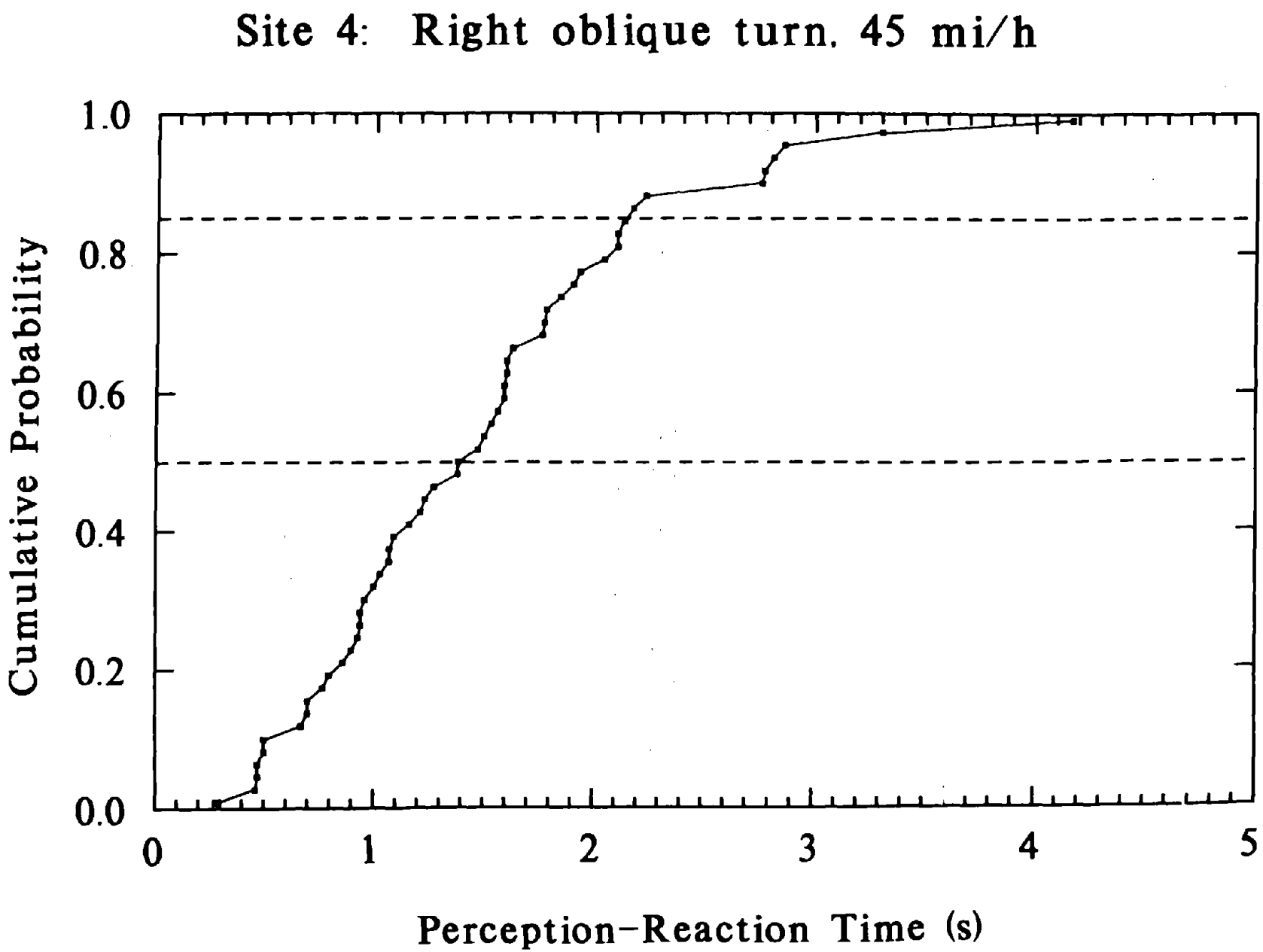


Figure 19. Cumulative frequency plots for site 4: through, divided, 55 mi/h, perception-reaction time(s).

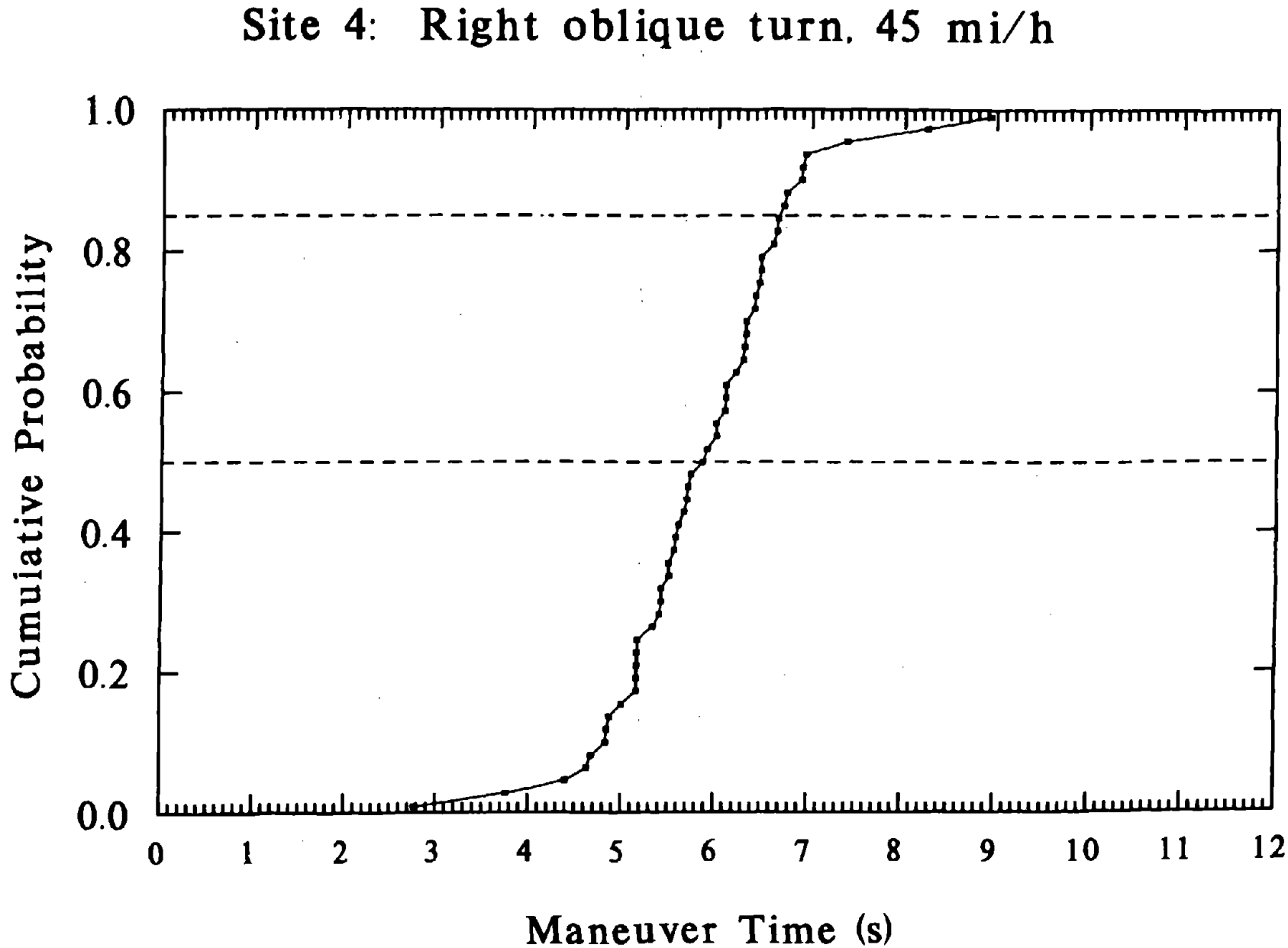


Figure 20. Cumulative frequency plots for site 4: through, divided, 55 mi/h, maneuver time(s).

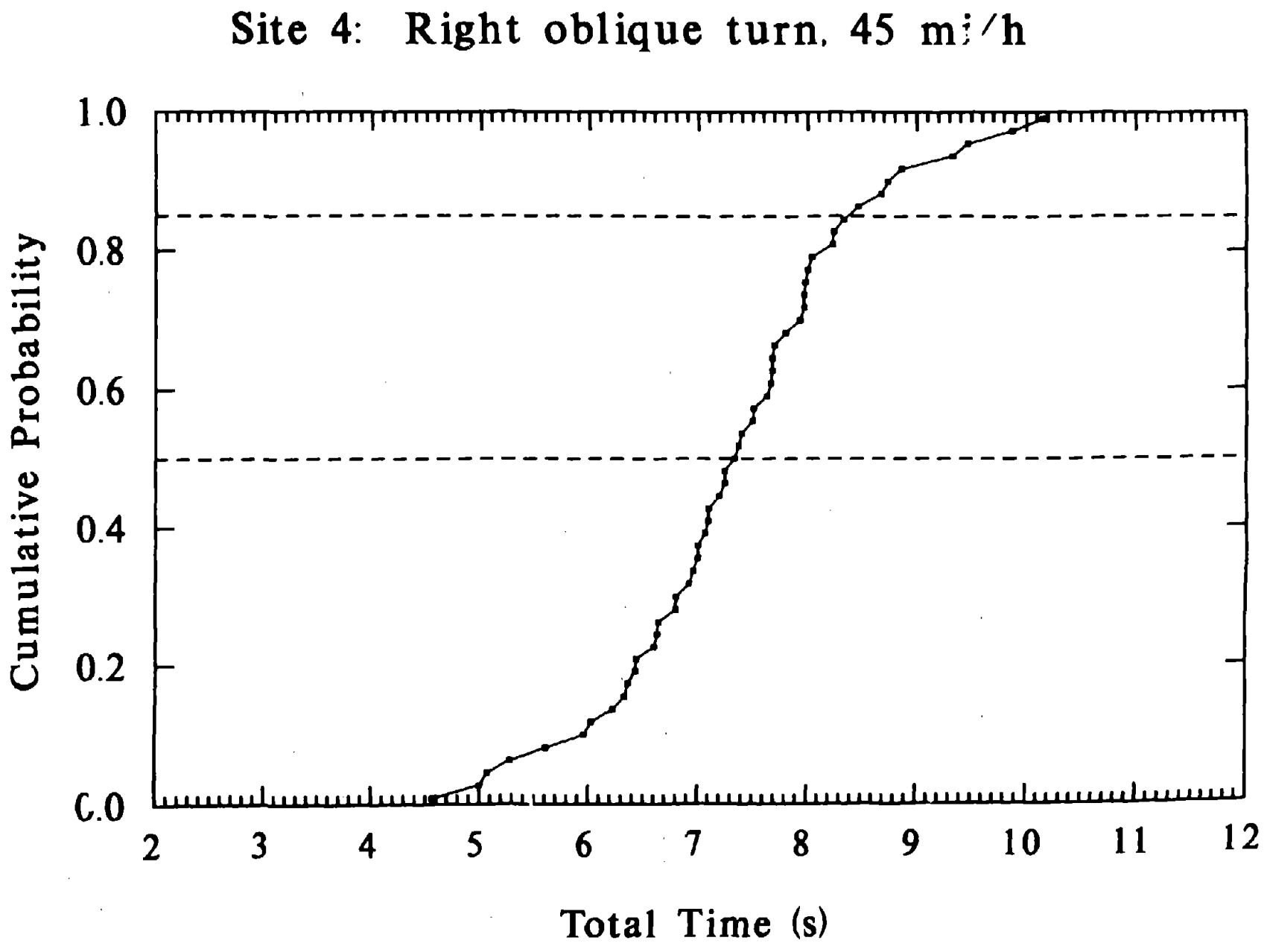


Figure 21. Cumulative frequency plots for site 4: through, divided, 55 mi/h, total time(s).

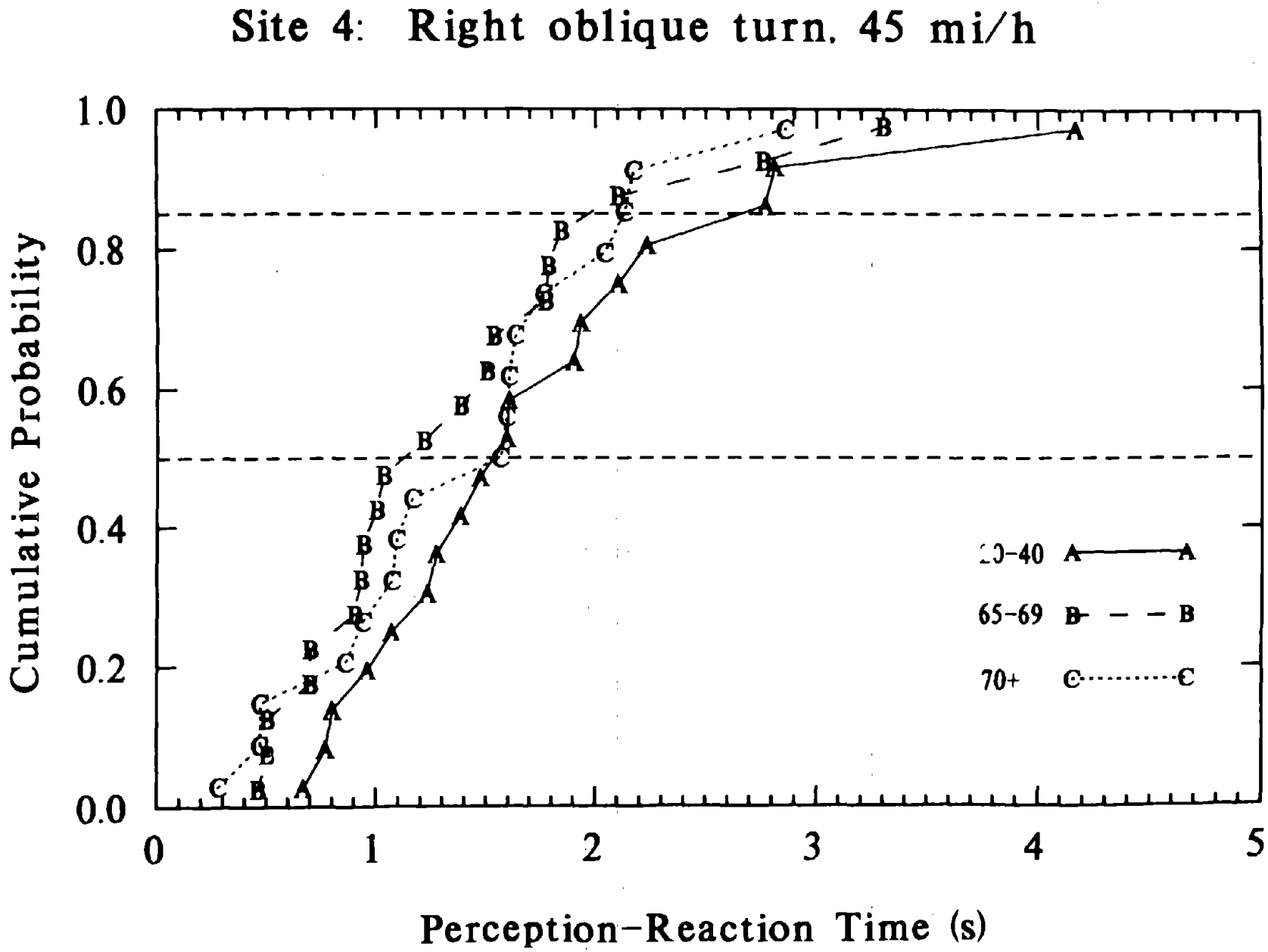


Figure 22. Cumulative frequency plots for site 4: through, divided, 55 mi/h, perception-reaction time(s), by age.

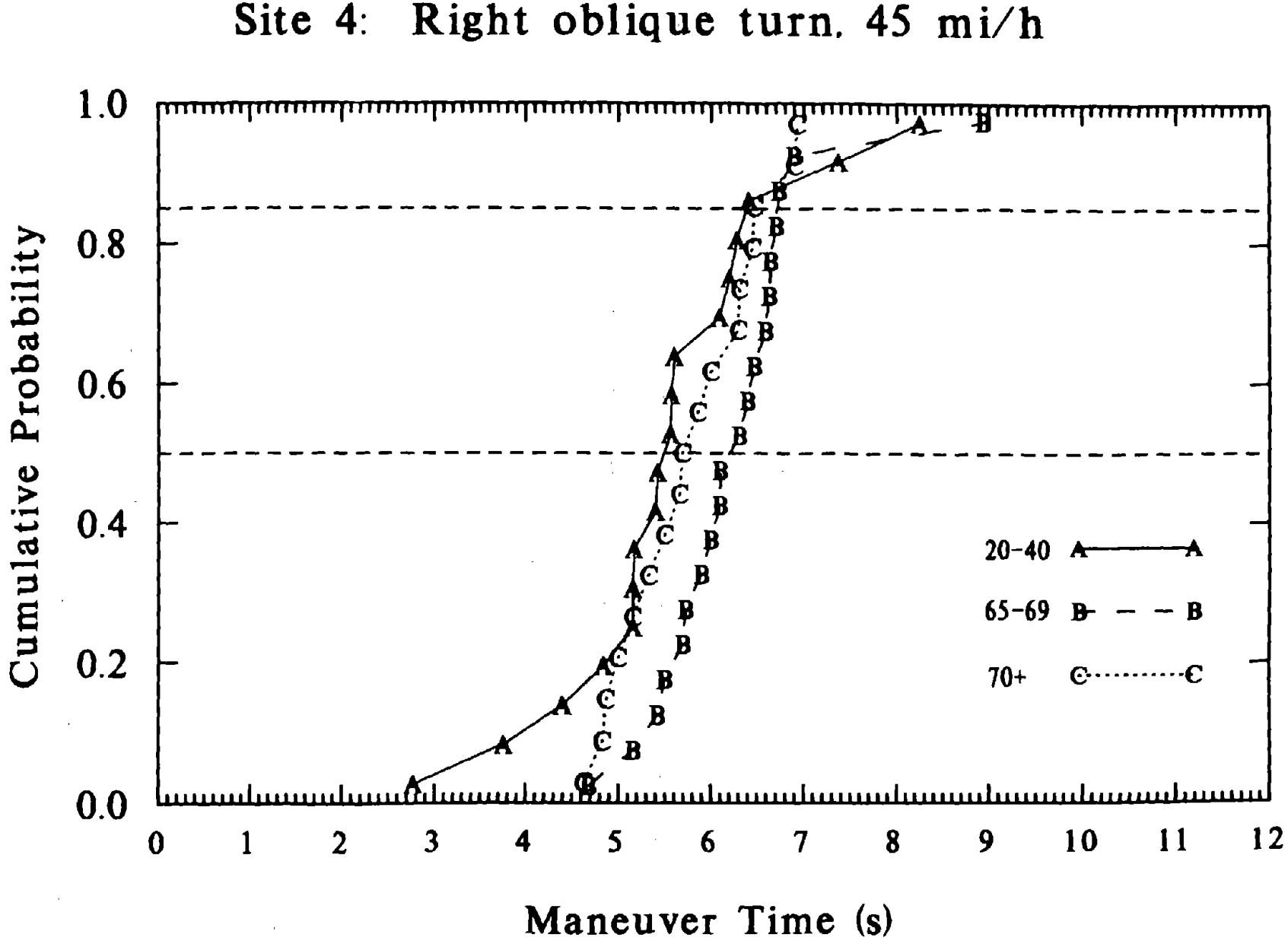


Figure 23. Cumulative frequency plots for site 4: through, divided, 55 mi/h, maneuver time(s), by age.

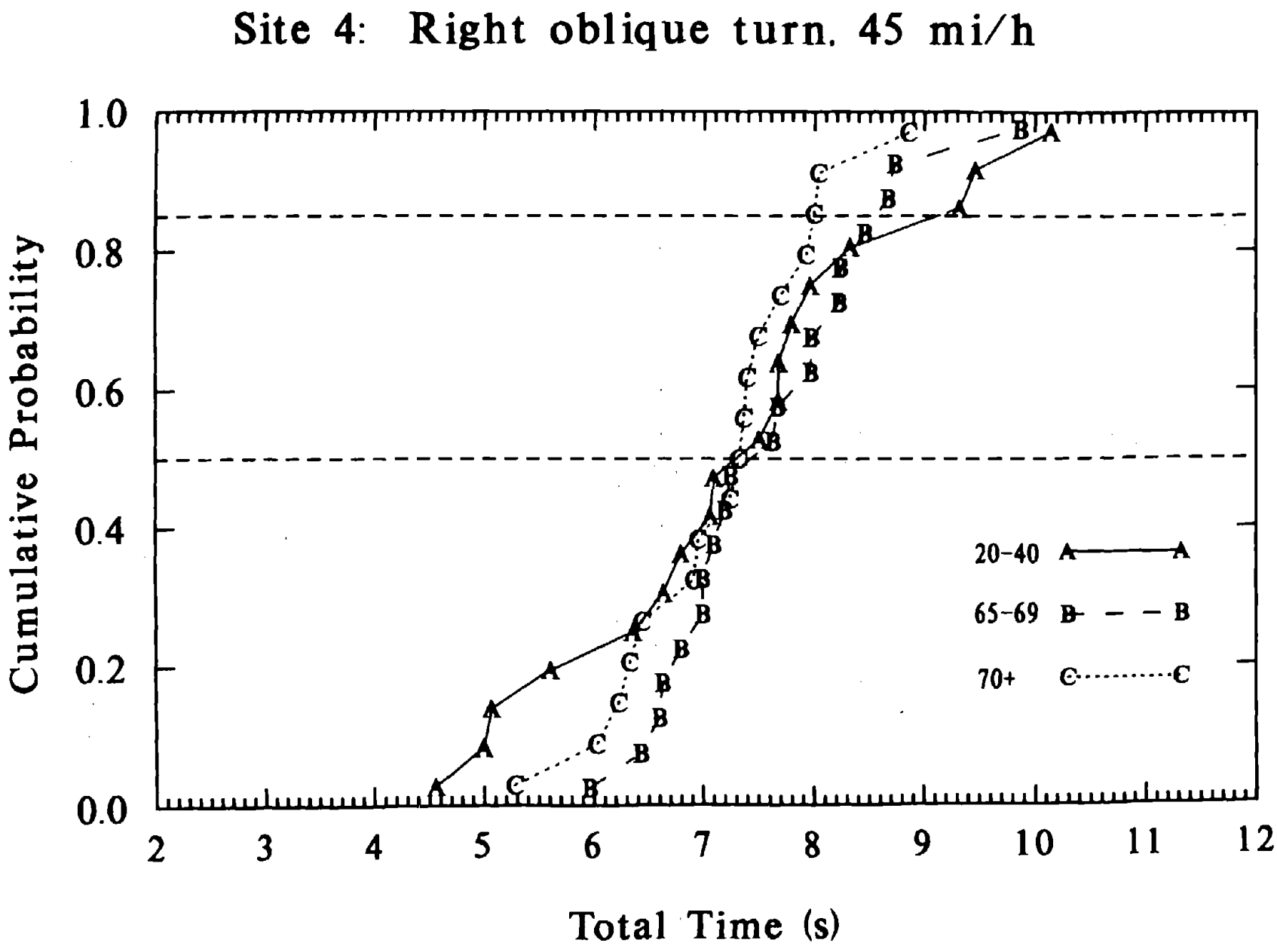


Figure 24. Cumulative frequency plots for site 4: through, divided, 55 mi/h, total time(s), by age.

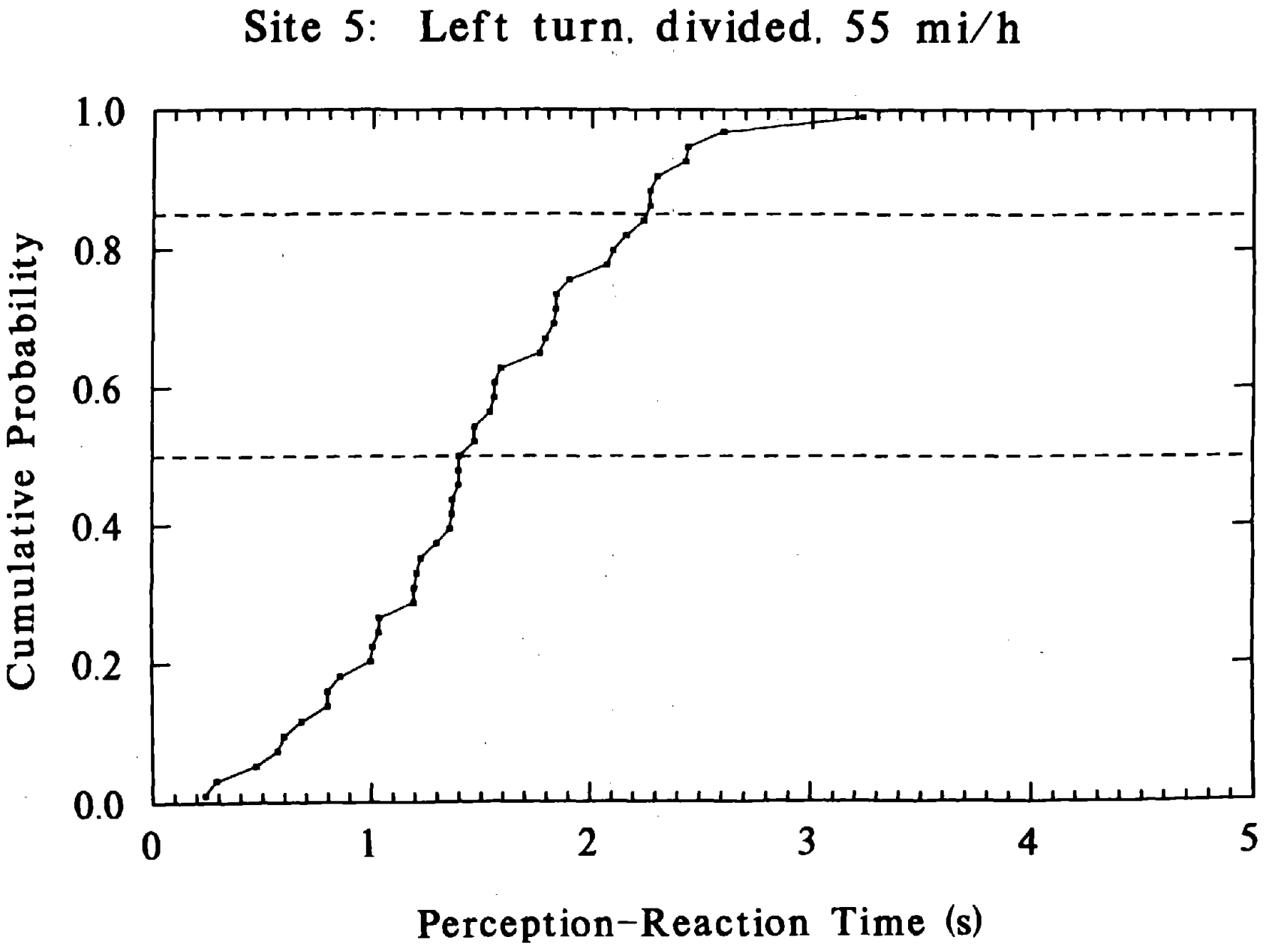


Figure 25. Cumulative frequency plots for site 5: through, divided, 55 mi/h, perception-reaction time(s).

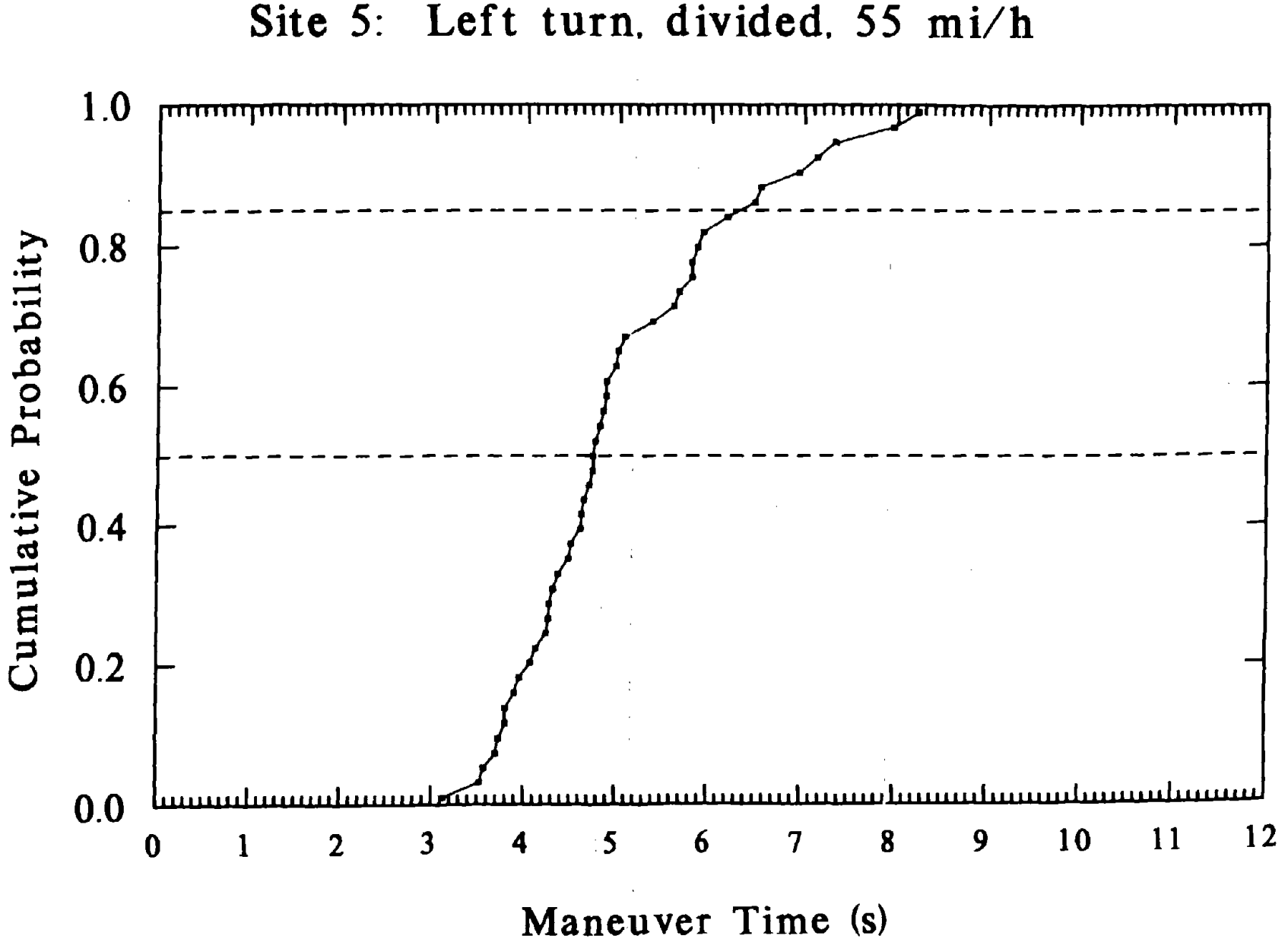


Figure 26. Cumulative frequency plots for site 5: through, divided, 55 mi/h, maneuver time(s).

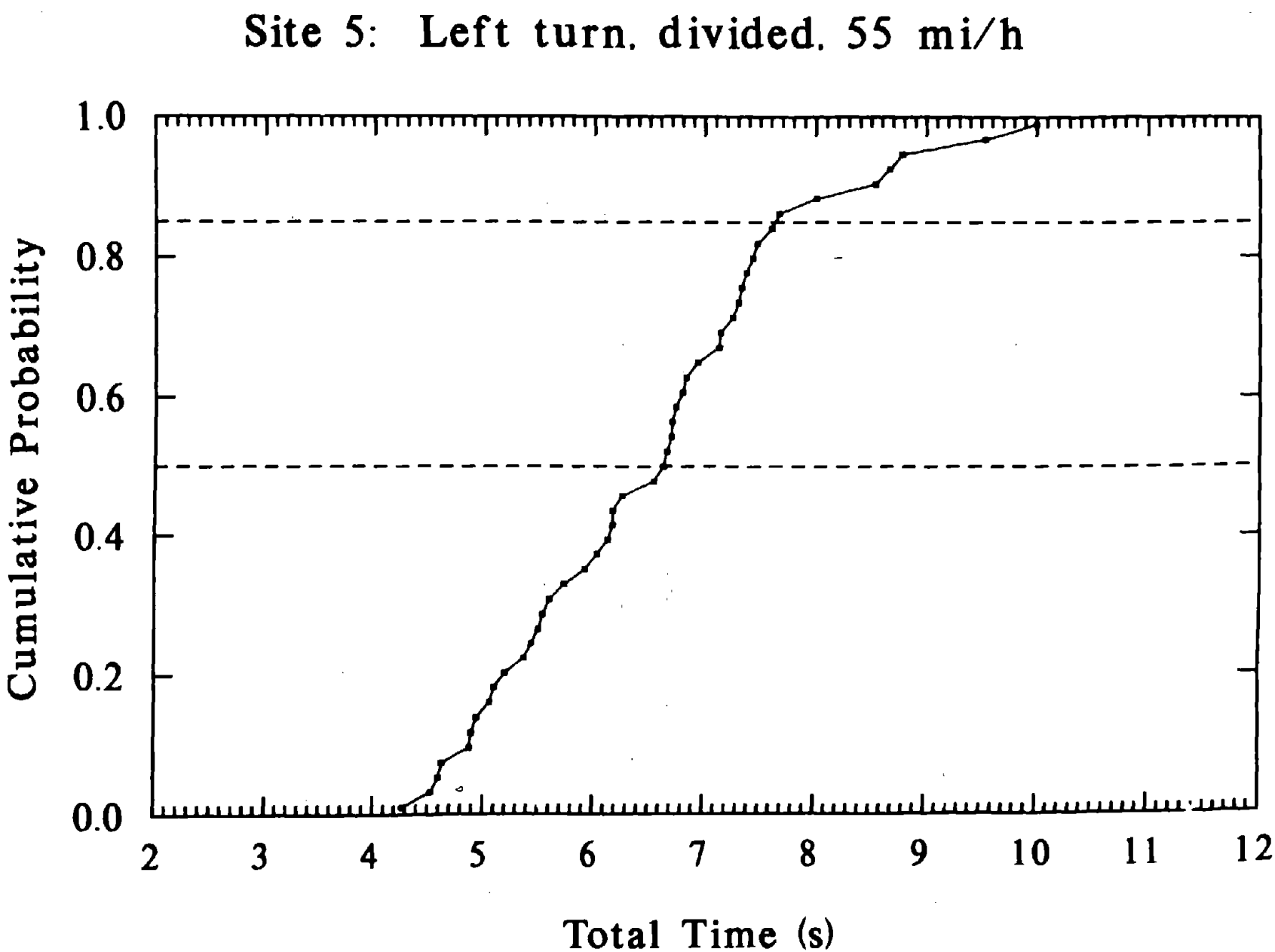


Figure 27. Cumulative frequency plots for site 5: through, divided, 55 mi/h, total time(s).

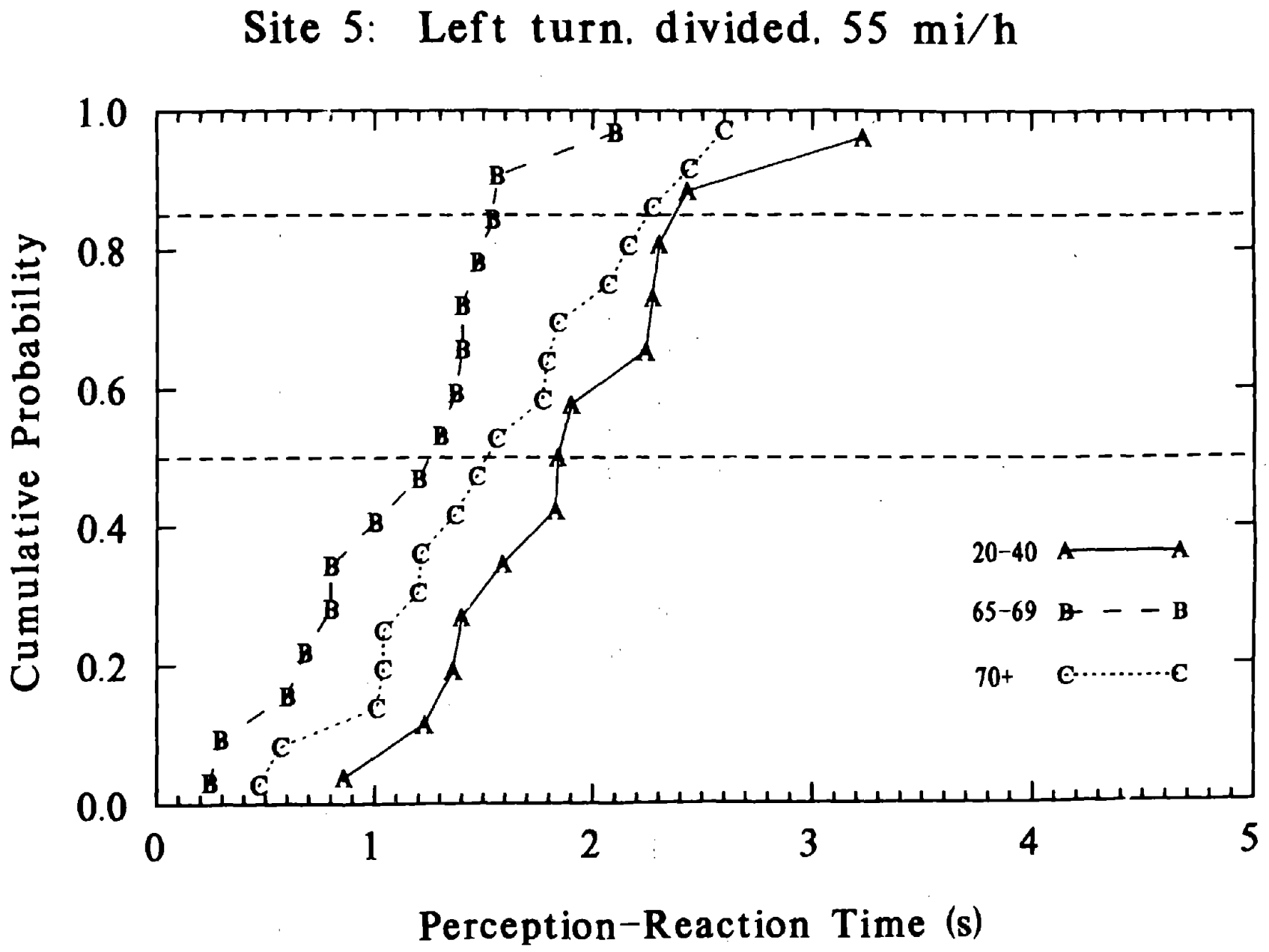


Figure 28. Cumulative frequency plots for site 5: through, divided, 55 mi/h, perception-reaction time(s), by age.

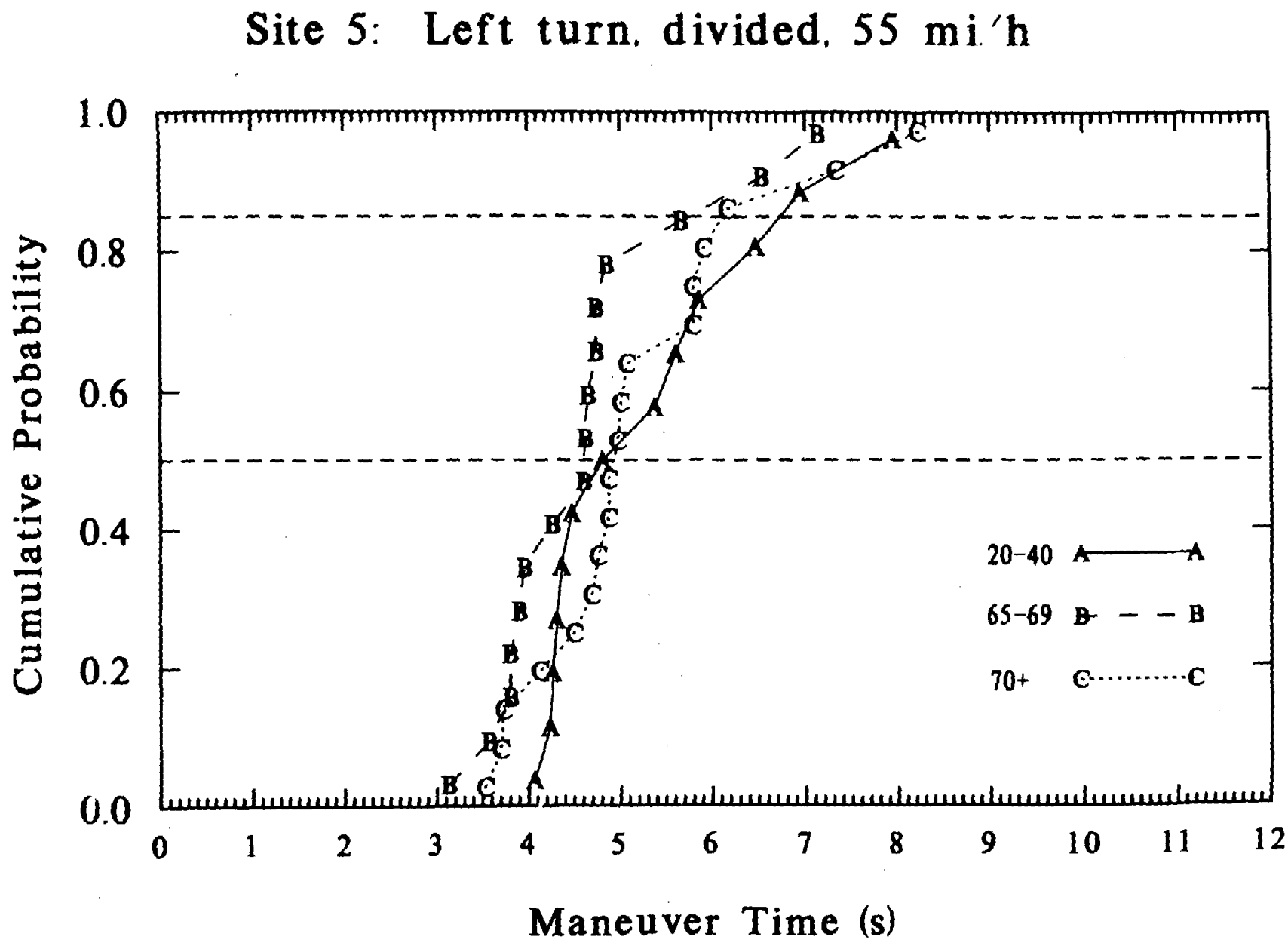


Figure 29. Cumulative frequency plots for site 5: through, divided, 55 mi/h, maneuver time(s), by age.

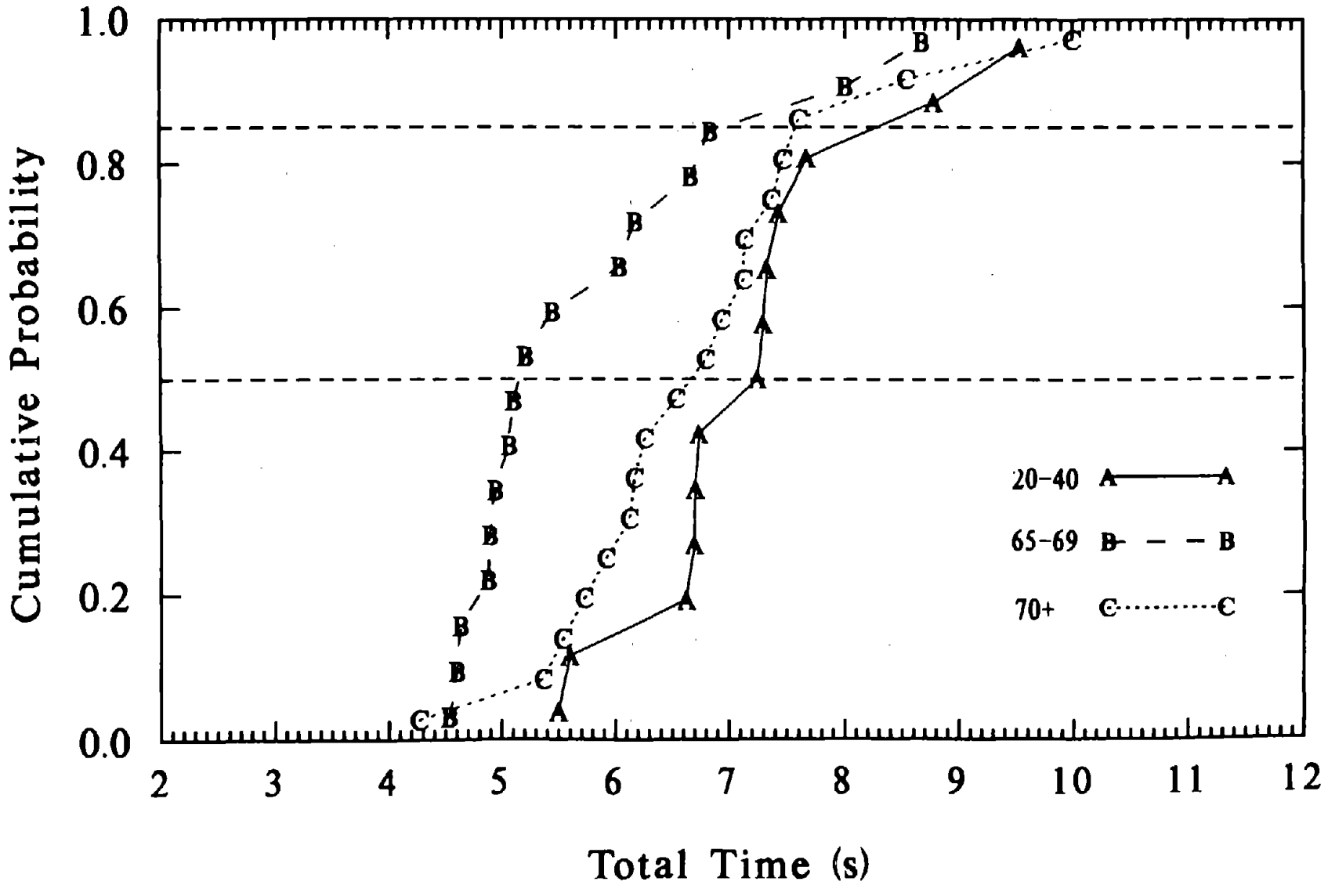


Figure 30. Cumulative frequency plots for site 5: through, divided, 55 mi/h, total time(s), by age.

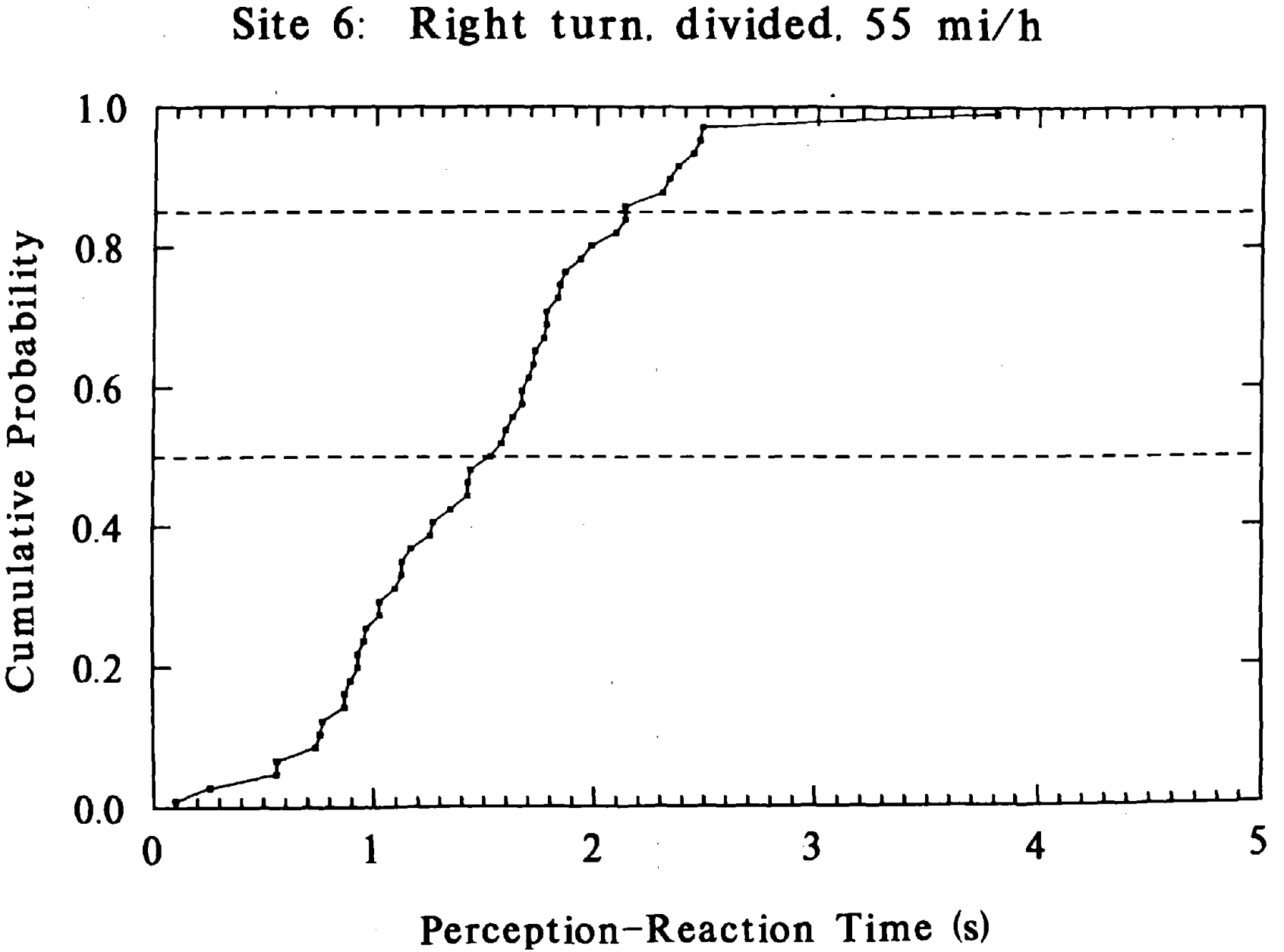


Figure 31. Cumulative frequency plots for site 6: through, divided, 55 mi/h, perception-reaction time(s).

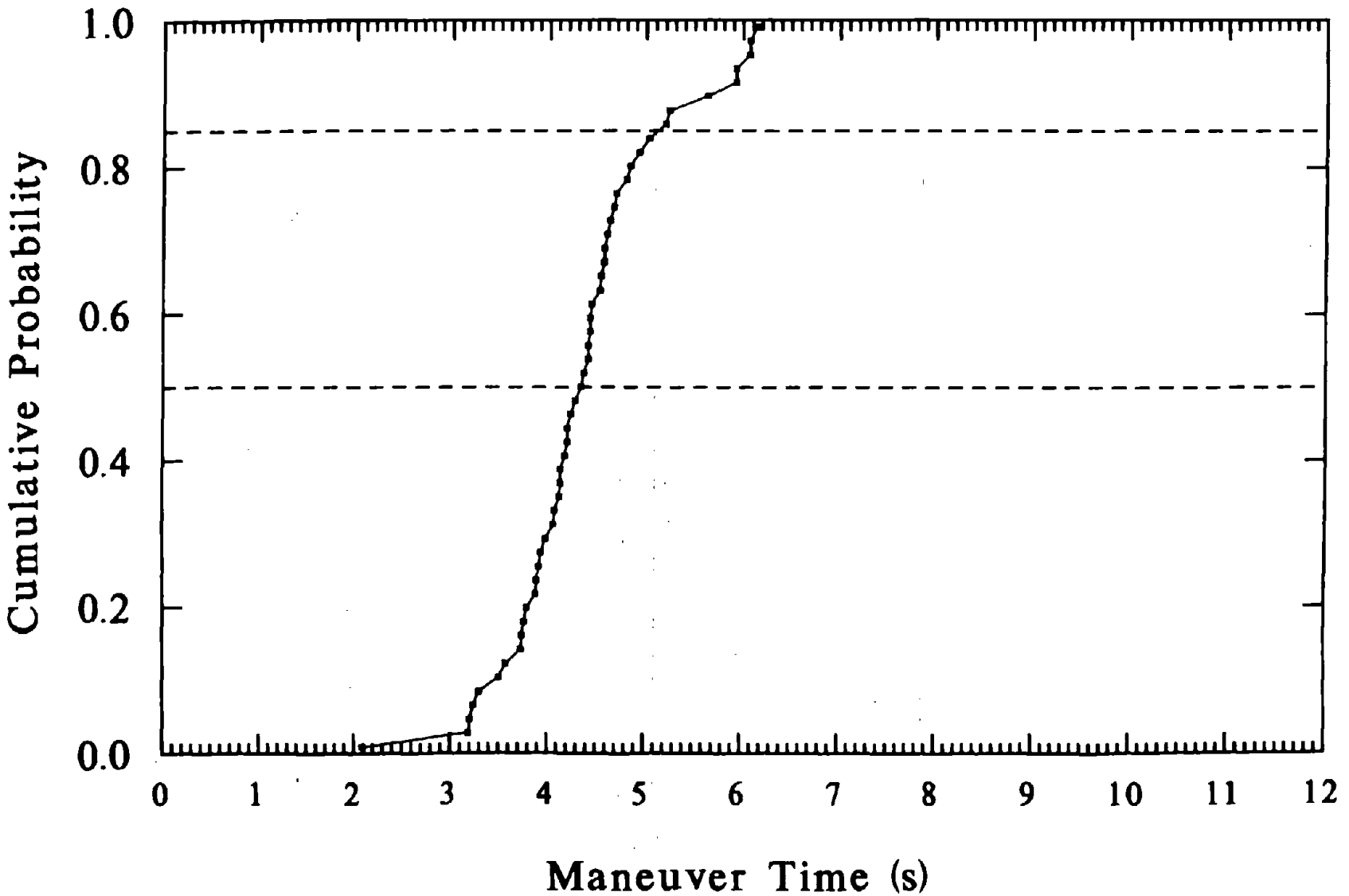


Figure 32. Cumulative frequency plots for site 6: through, divided, 55 mi/h, maneuver time(s).

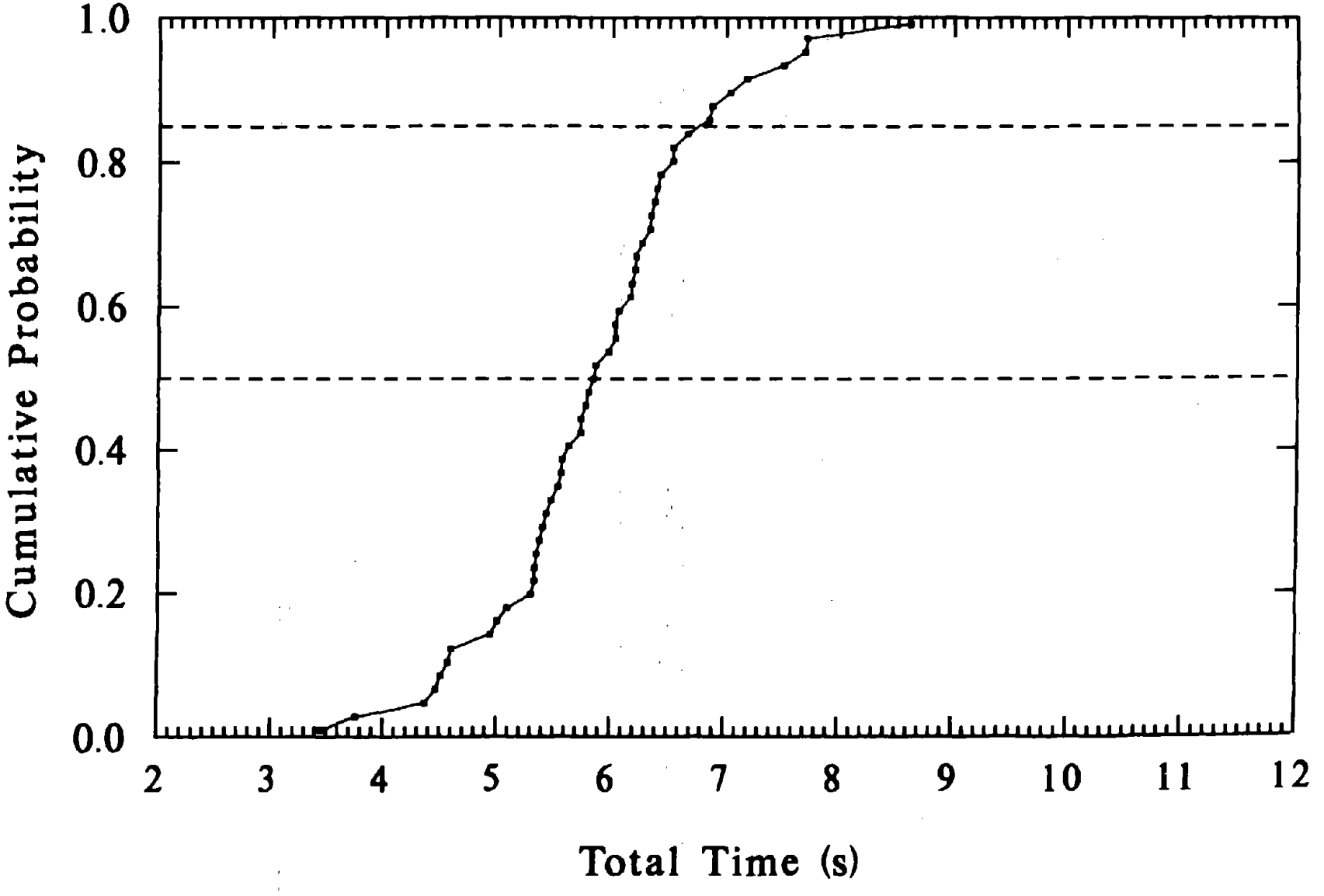


Figure 33. Cumulative frequency plots for site 6: through, divided, 55 mi/h, total time(s).

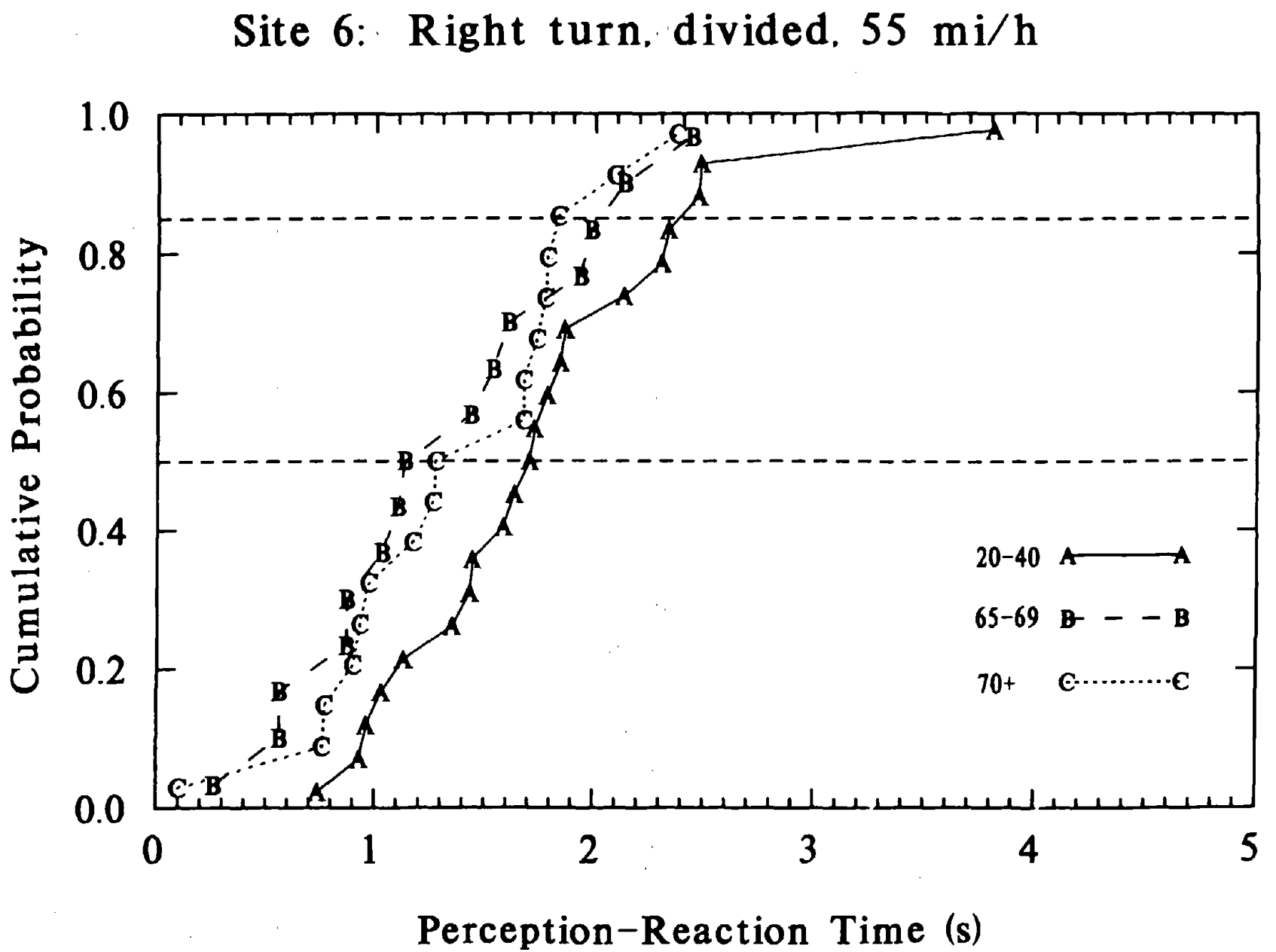


Figure 34. Cumulative frequency plots for site 6: through, divided, 55 mi/h, perception-reaction time(s), by age.

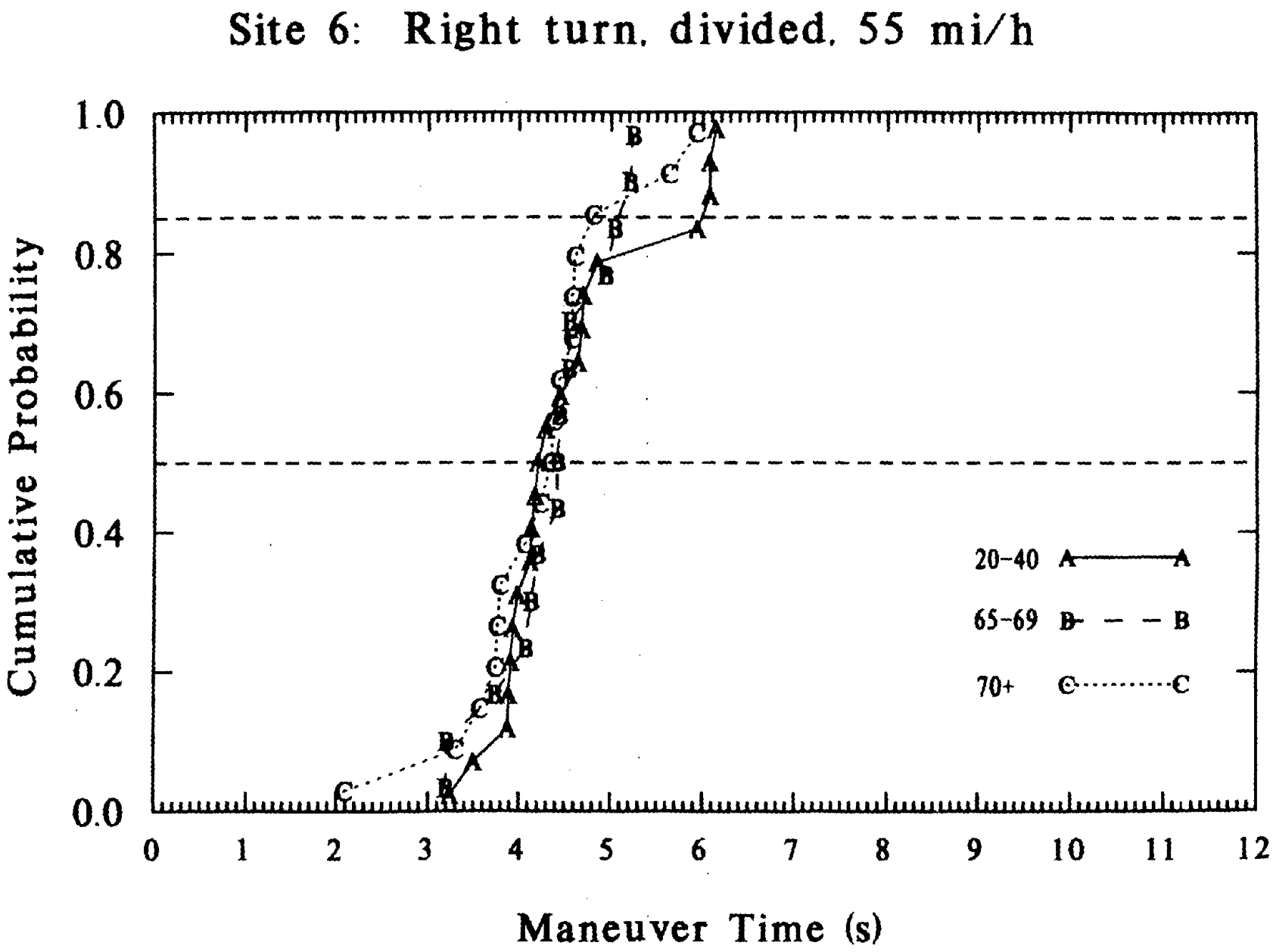


Figure 35. Cumulative frequency plots for site 6: through, divided, 55 mi/h, maneuver time(s), by age.

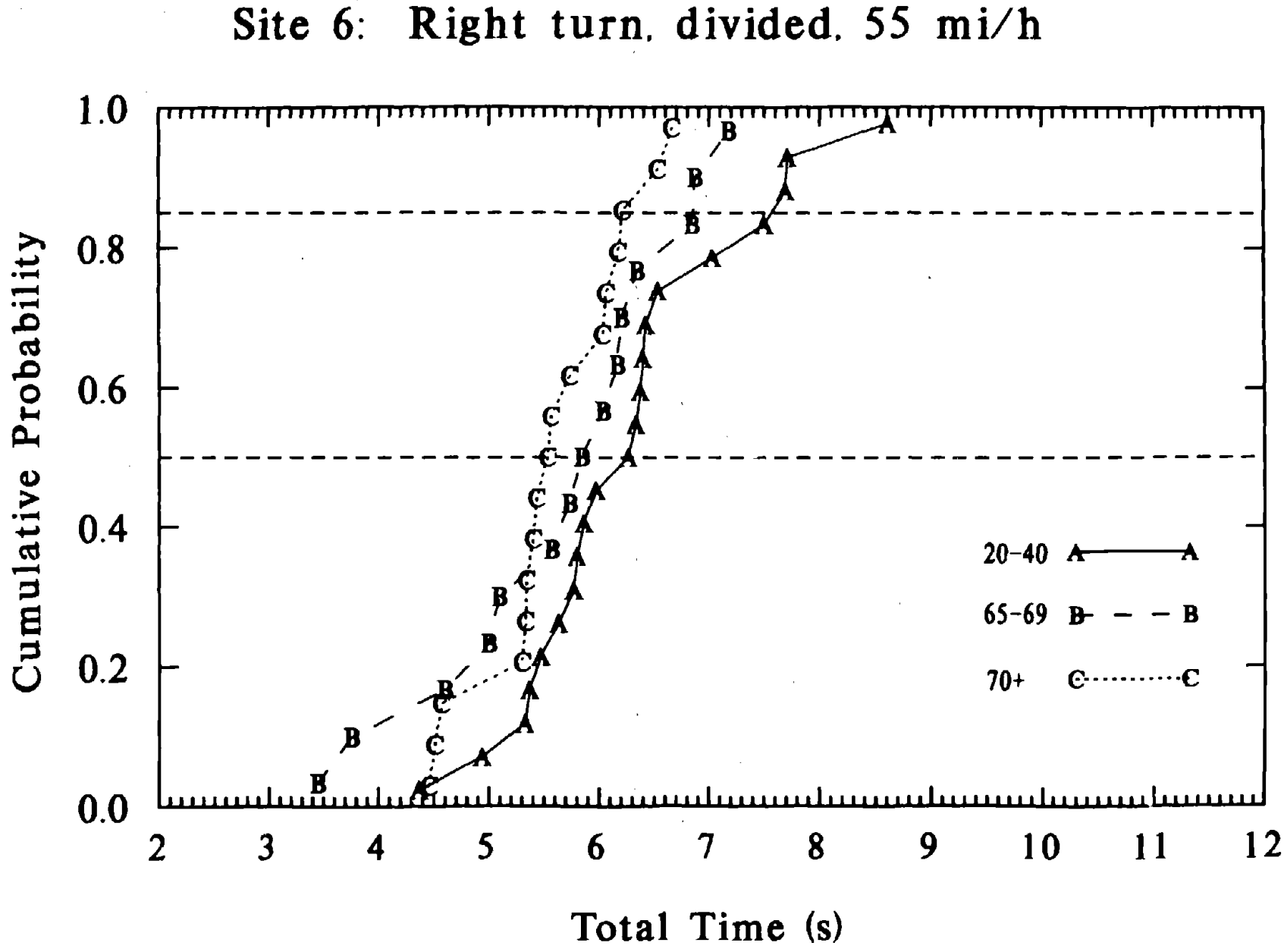


Figure 36. Cumulative frequency plots for site 6: through, divided, 55 mi/h, total time(s), by age.

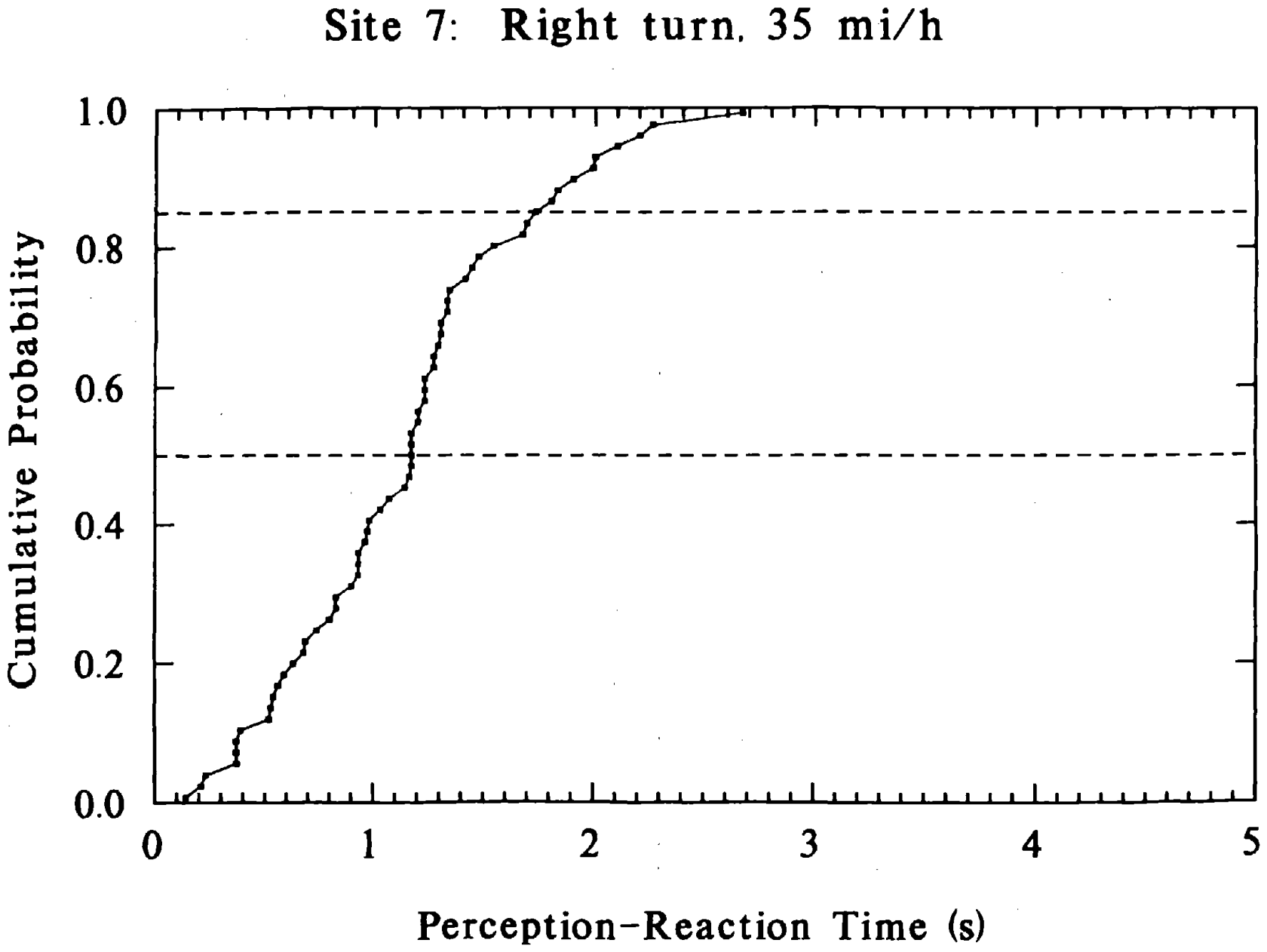


Figure 37. Cumulative frequency plots for site 7: *through,* divided, 55 mi/h, perception-reaction time(s).

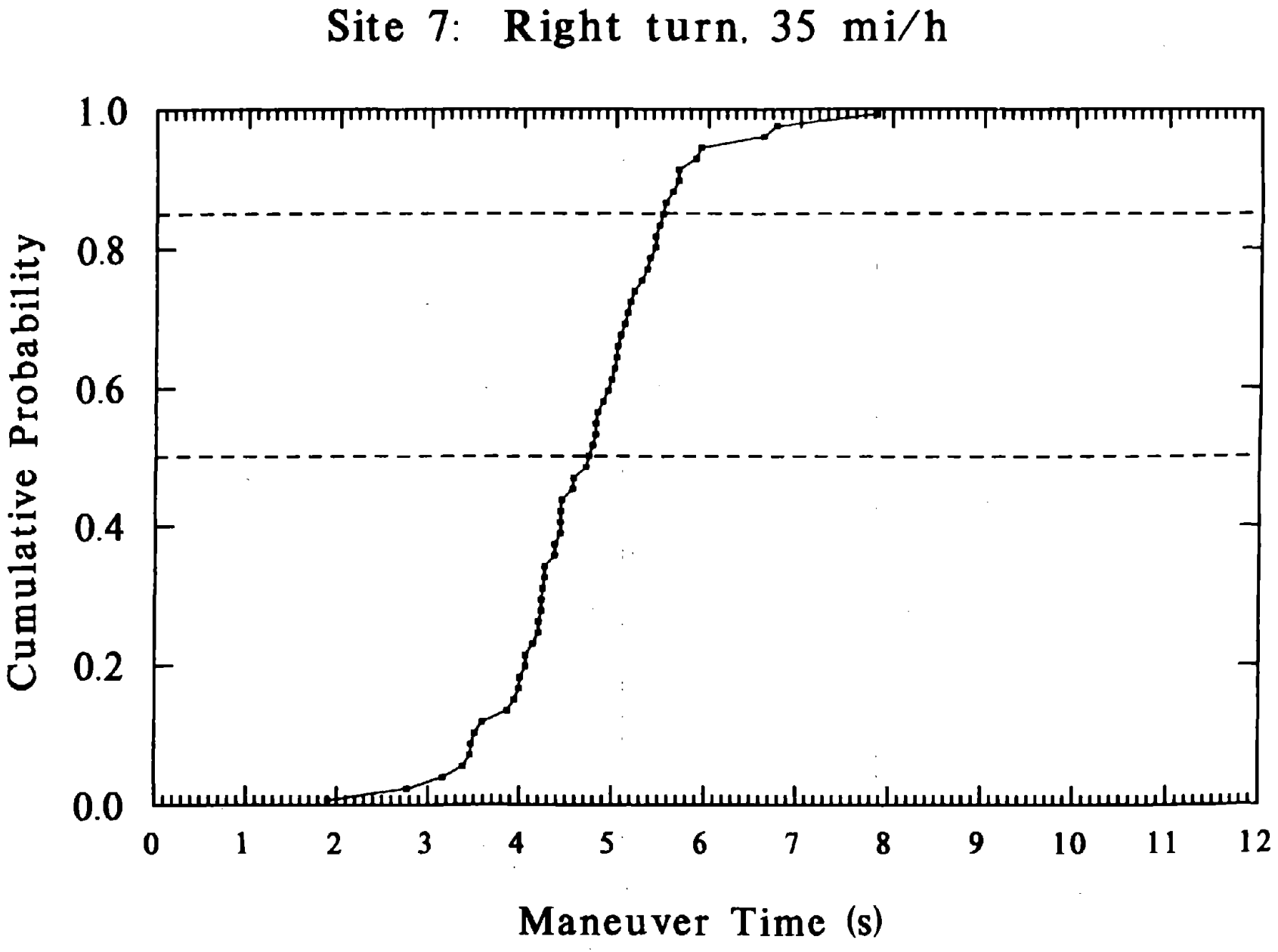


Figure 38. Cumulative frequency plots for site 7: through, divided, 55 mi/h, maneuver time(s).

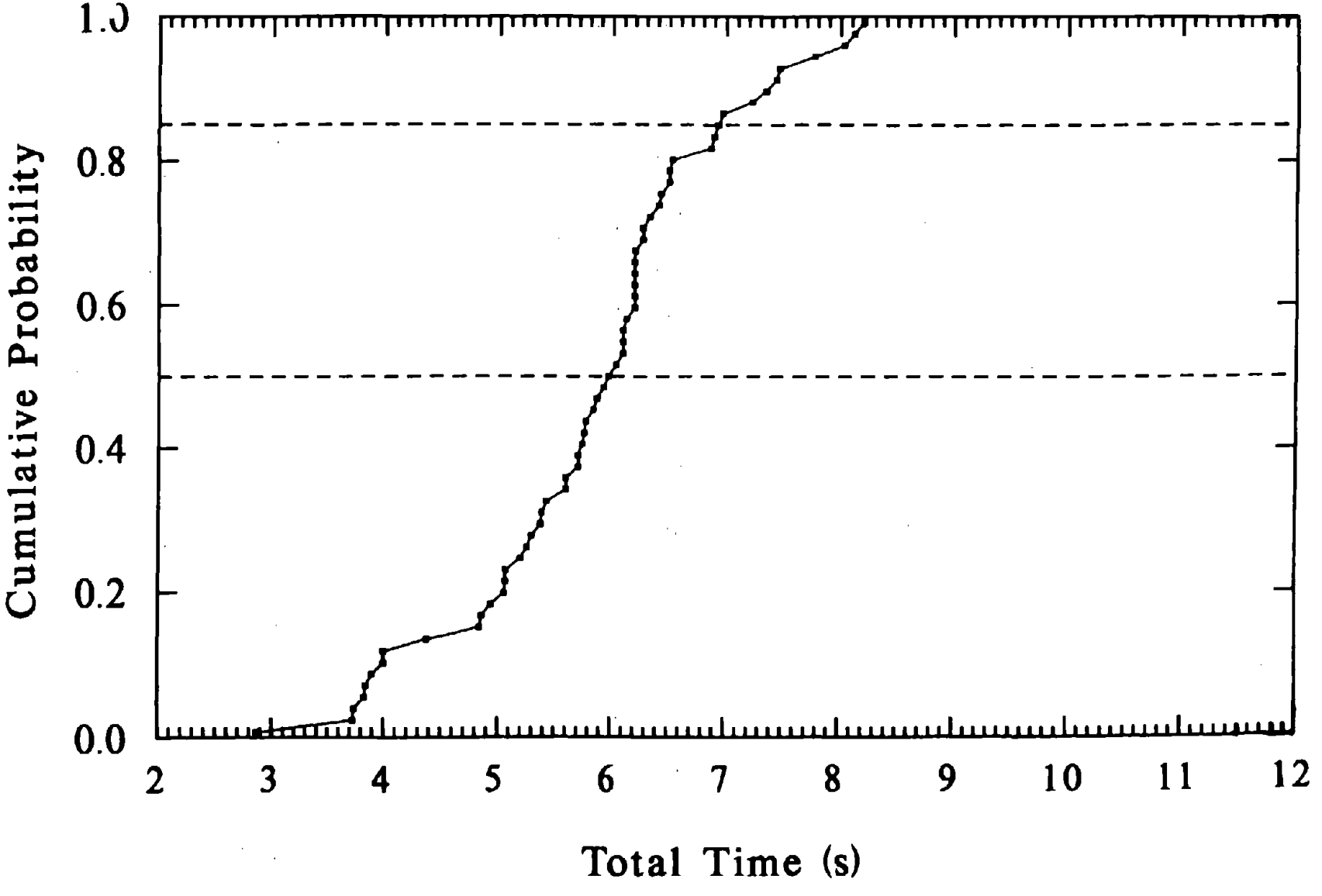


Figure 39. Cumulative frequency plots for site 7: through, divided, 55 mi/h, total time(s).

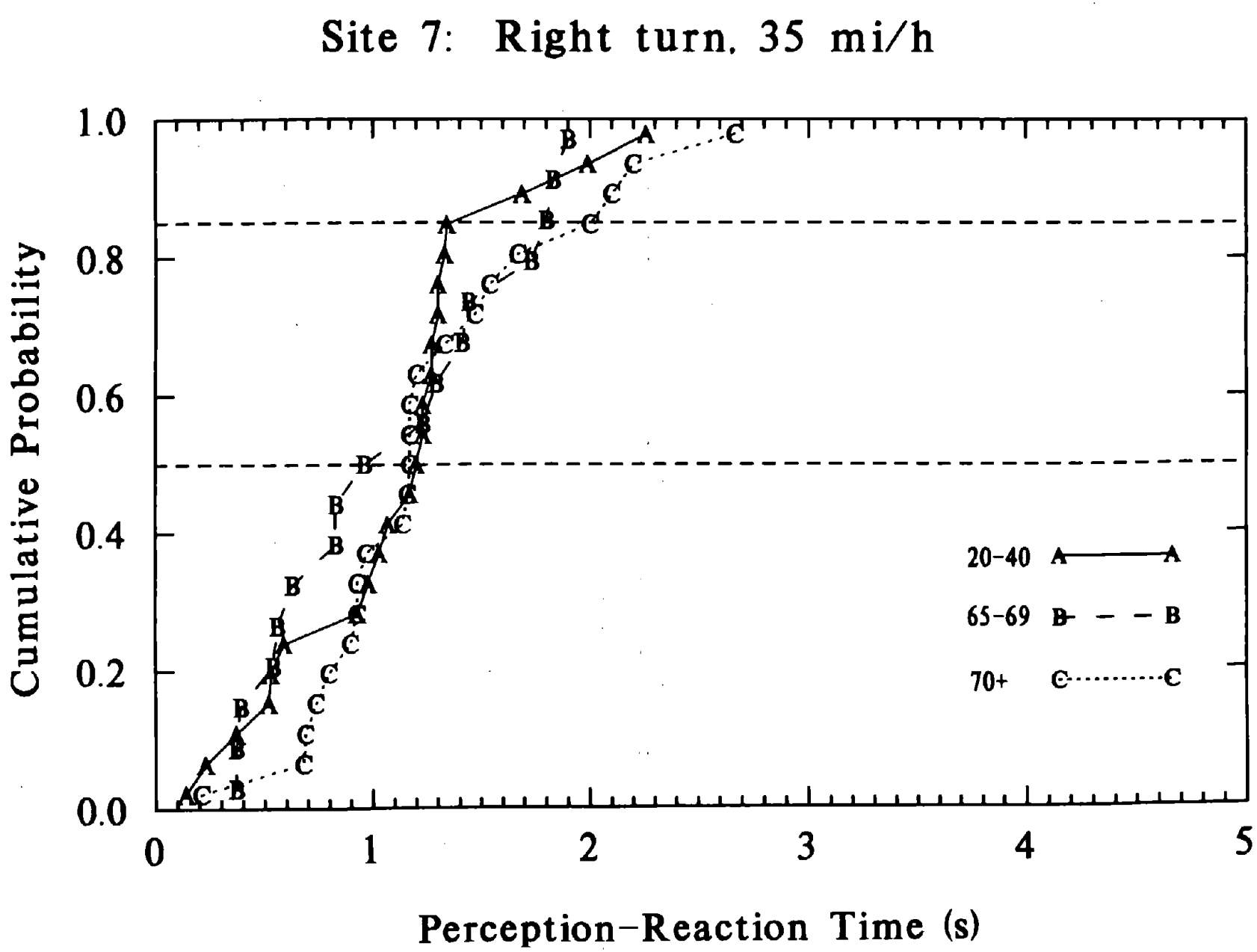


Figure 40. Cumulative frequency plots for site 7: through, divided, 55 mi/h, perception-reaction time(s), by age.

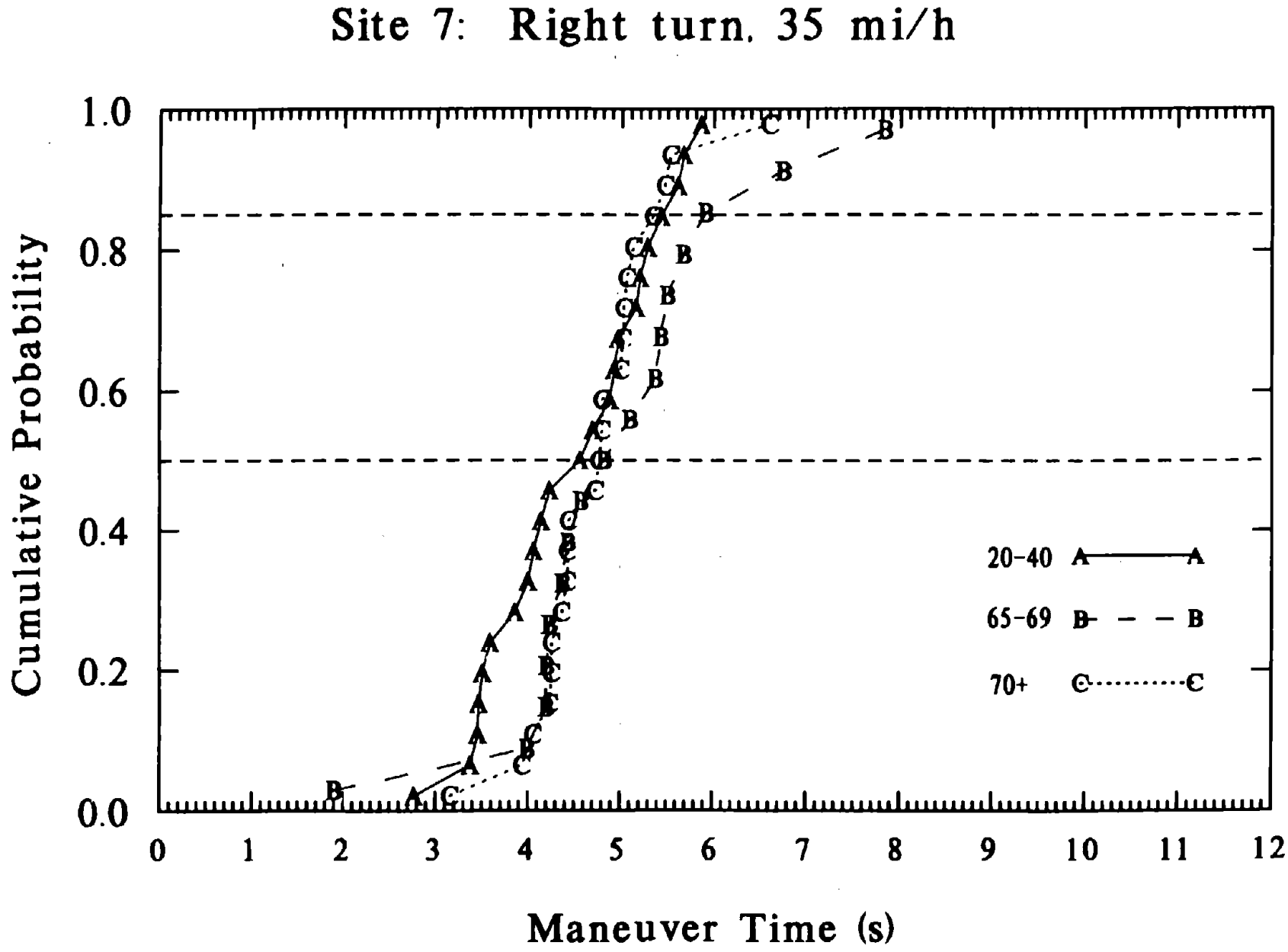


Figure 41. Cumulative frequency plots for site 7: through, divided, 55 mi/h, maneuver time(s), by age.

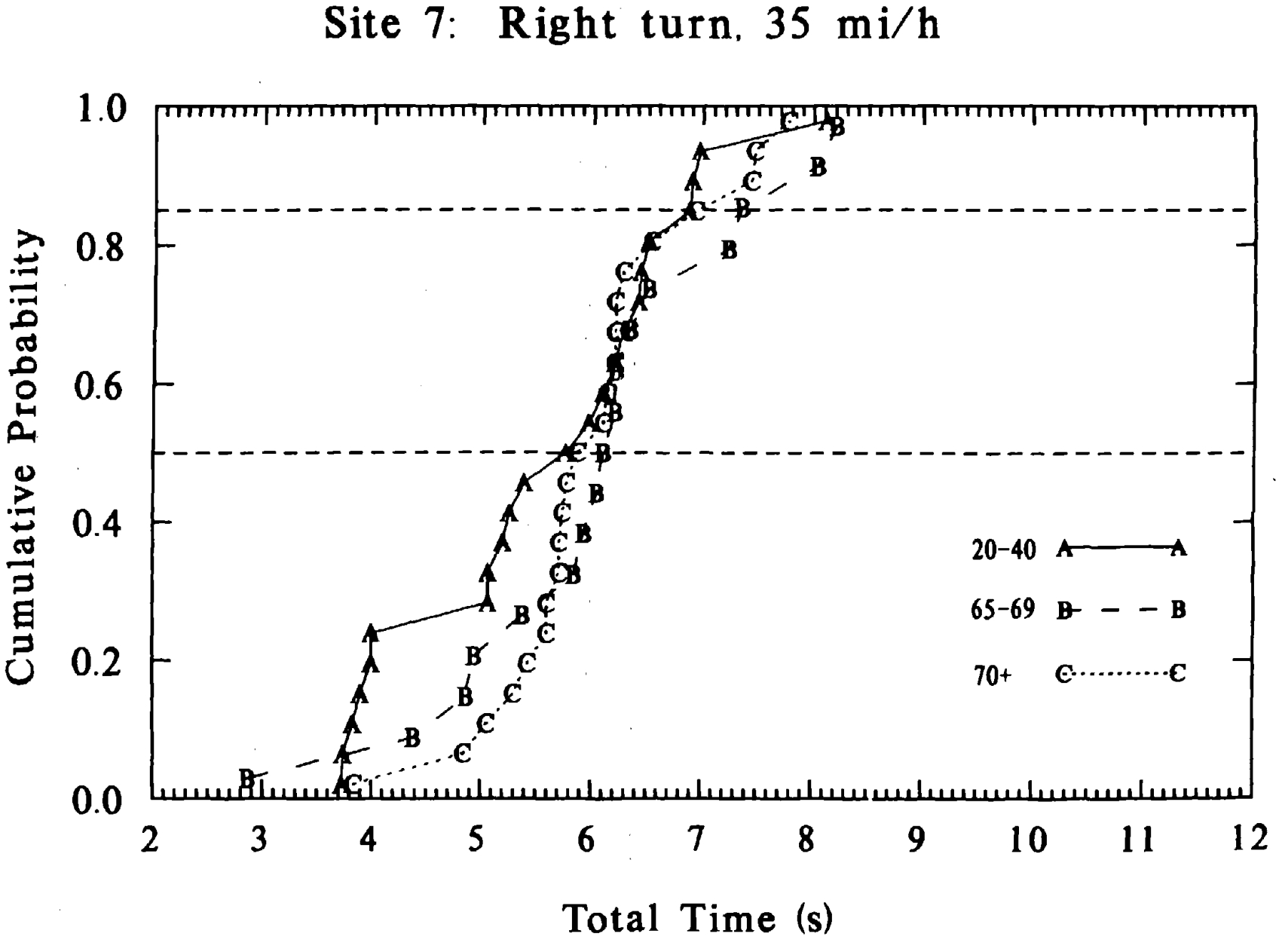


Figure 42. Cumulative frequency plots for site 7: through, divided, 55 mi/h, total time(s), by age.

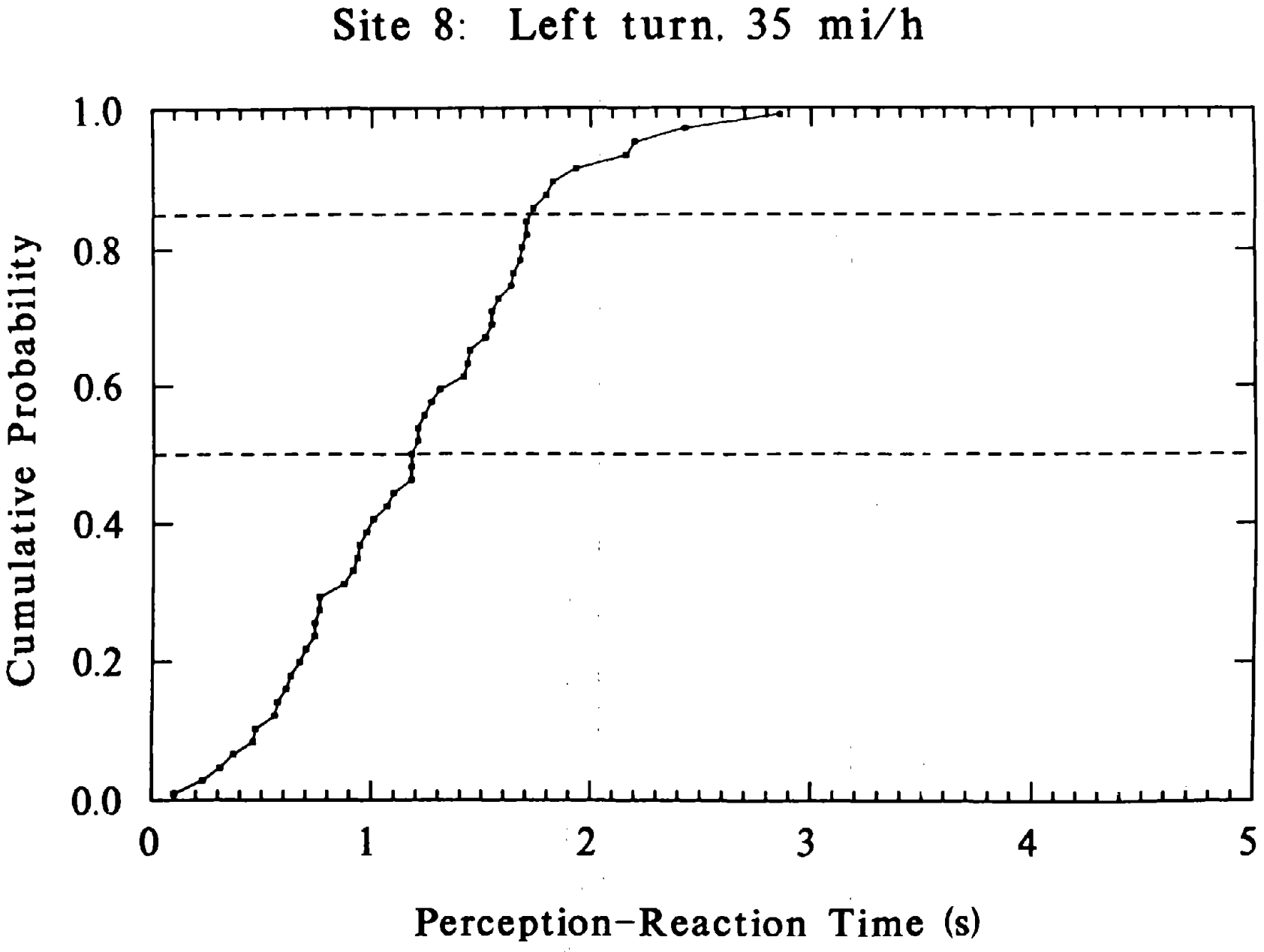


Figure 43. Cumulative frequency plots for site D: through, divided, 55 mi/h, perception-reaction time(s).

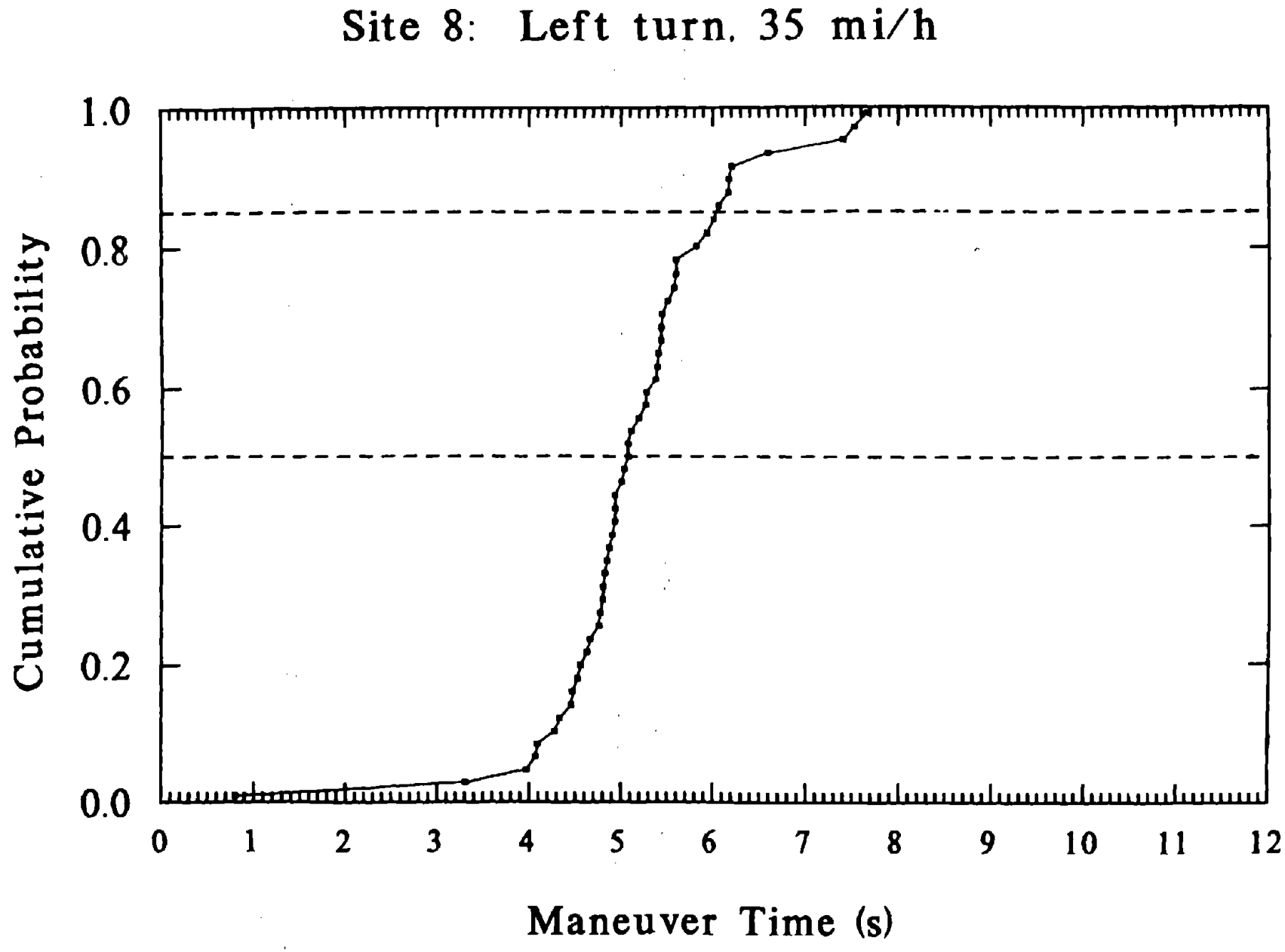


Figure 44. Cumulative frequency plots for site 8: through, divided, 55 mi/h, maneuver time(s).

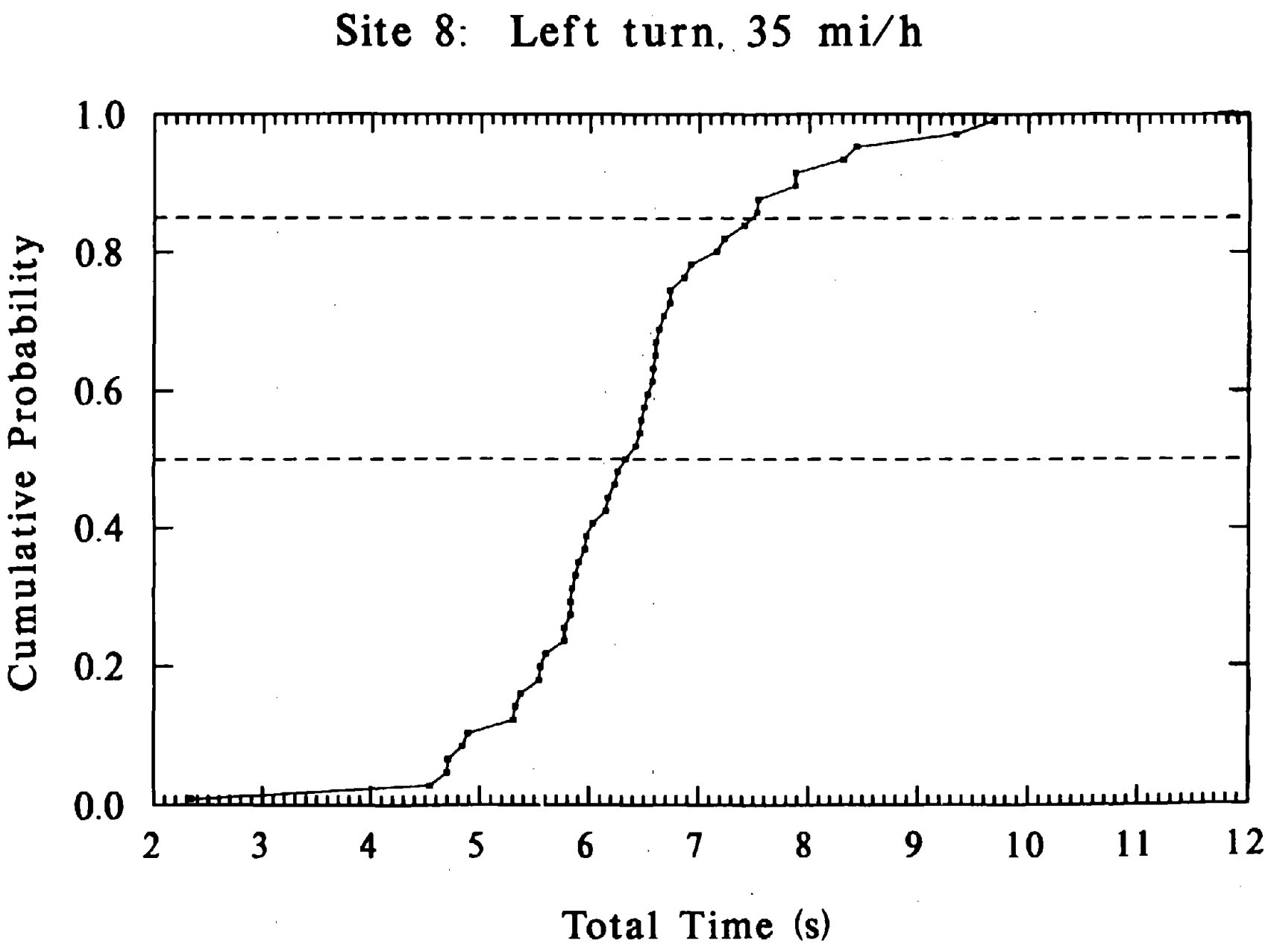


Figure 45. Cumulative frequency plots for site 8: through, divided, 55 mi/h, total time(s).

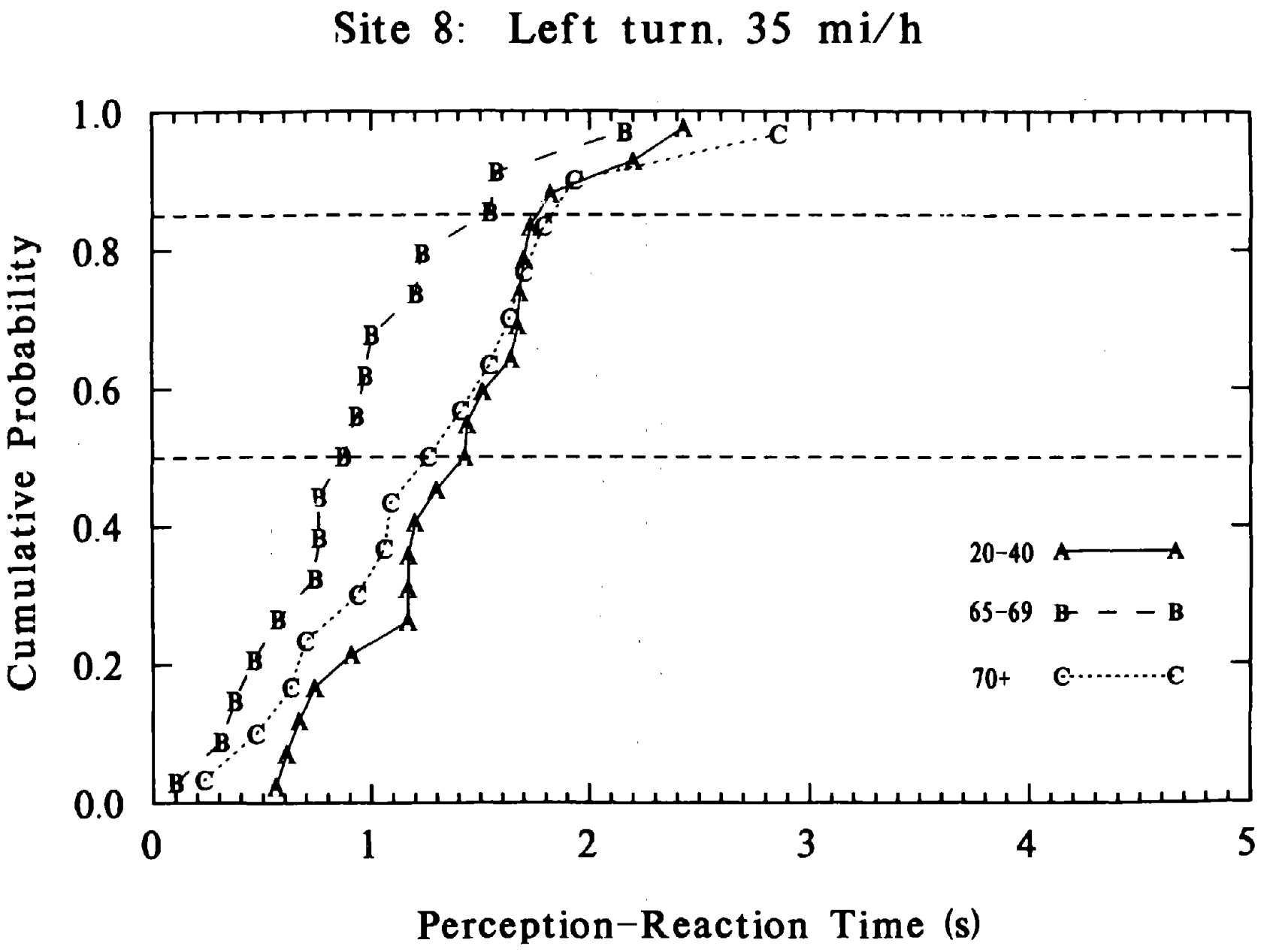


Figure 46. Cumulative frequency plots for site 8: through, divided, 55 mi/h, perception-reaction time(s), by age.

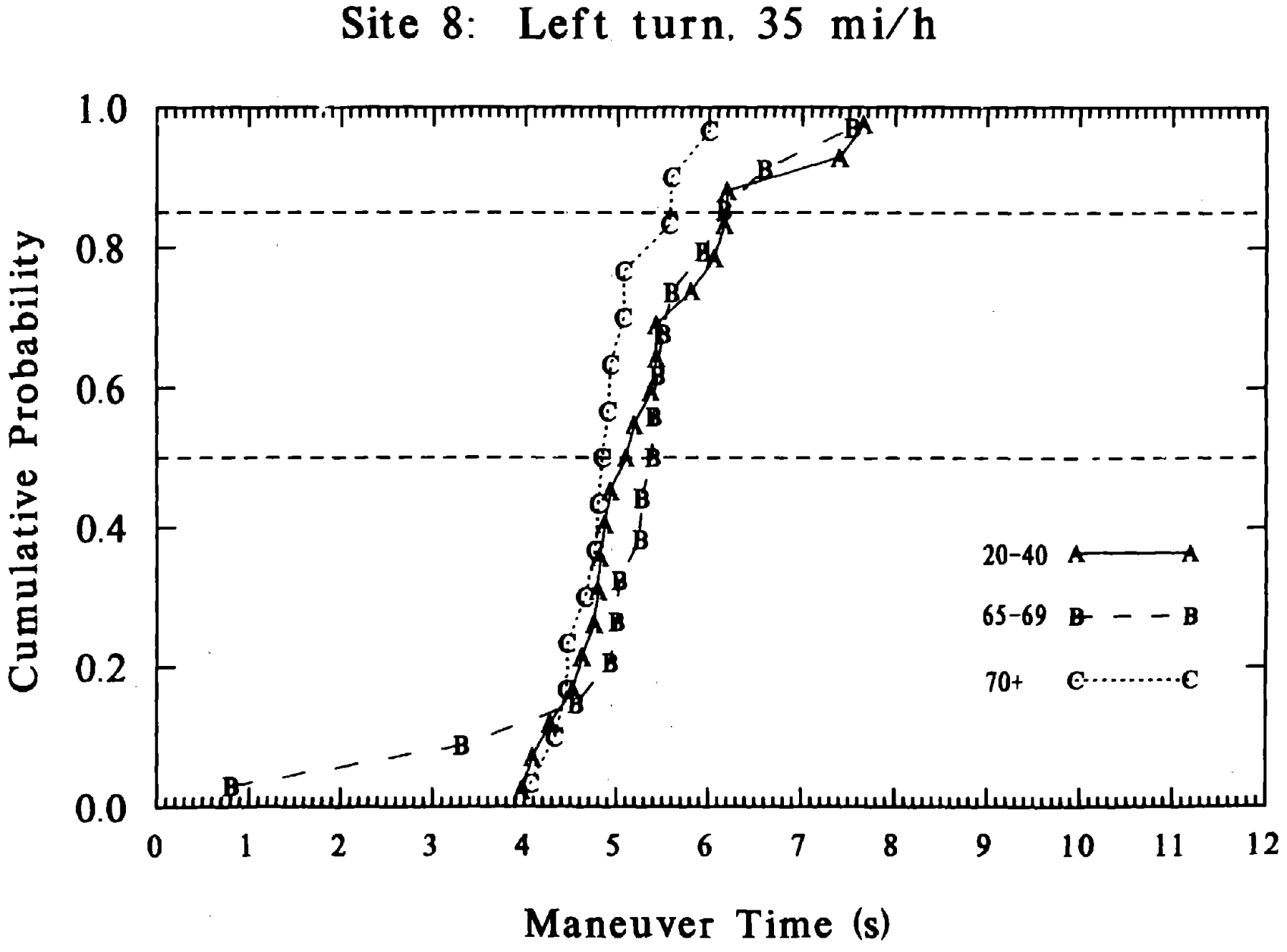
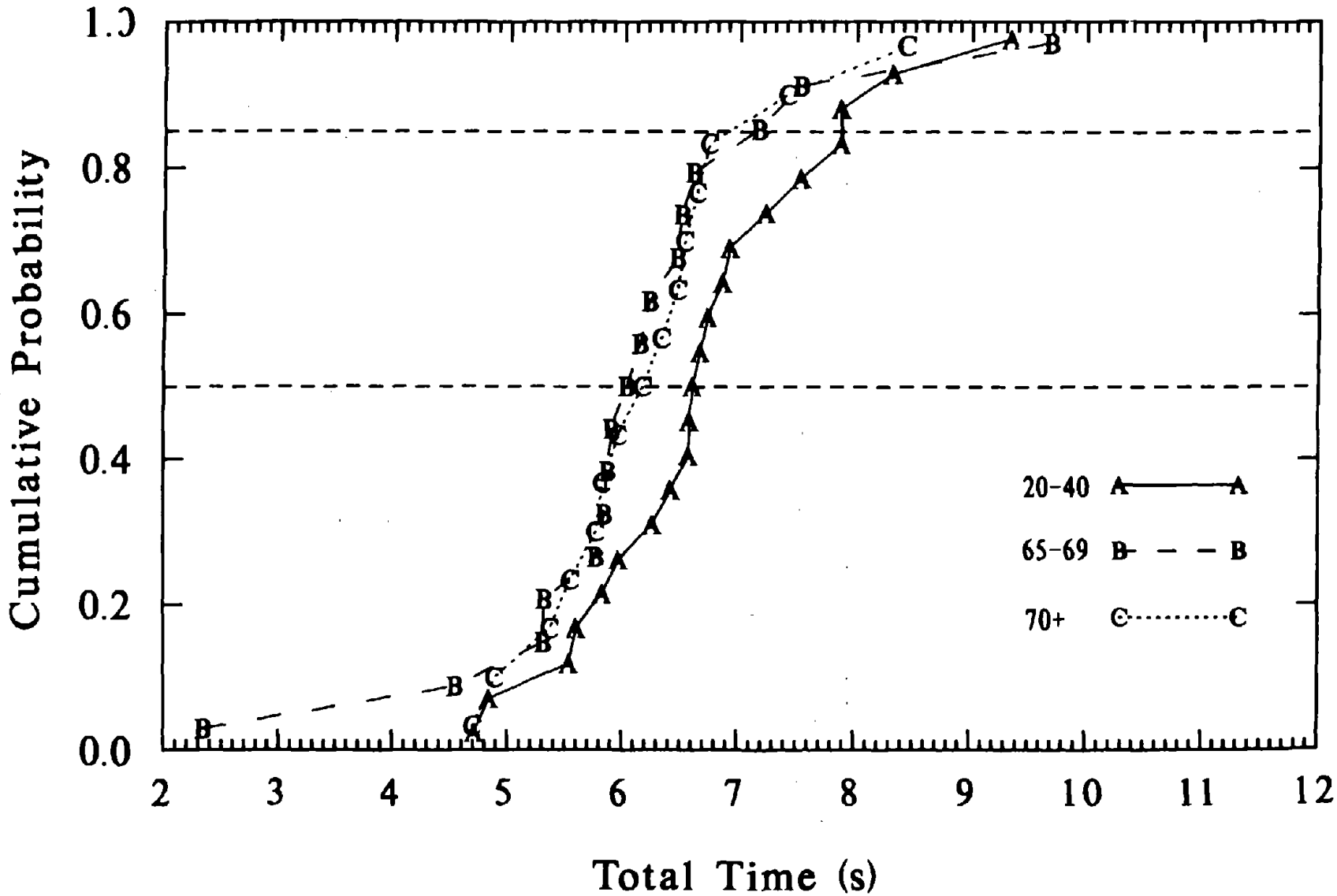


Figure 47. Cumulative frequency plots for site 8: through, divided, 55 mi/h, maneuver time(s), by age.


Site 8: Left turn, 35 mi/h
Cumulative Probability
1.0
0.8
0.6
0.4
0.2
0.0
2
3
4
5
6
7
8
9
10
11
12
Total Time (s)
20-40
65-69
70+

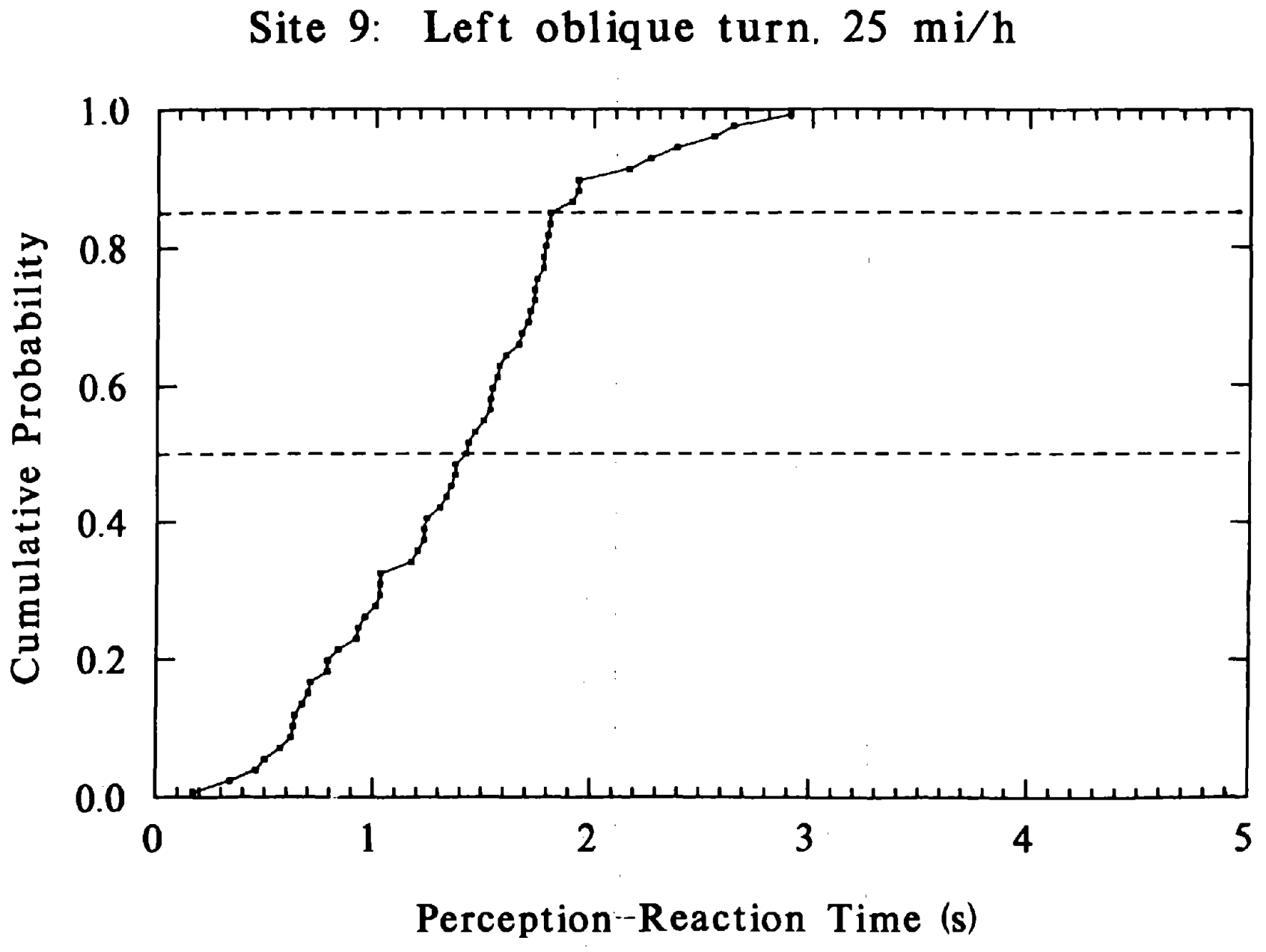


Figure 49. Cumulative frequency plots for site 9: through, divided, 55 mi/h, perception-reaction time(s).

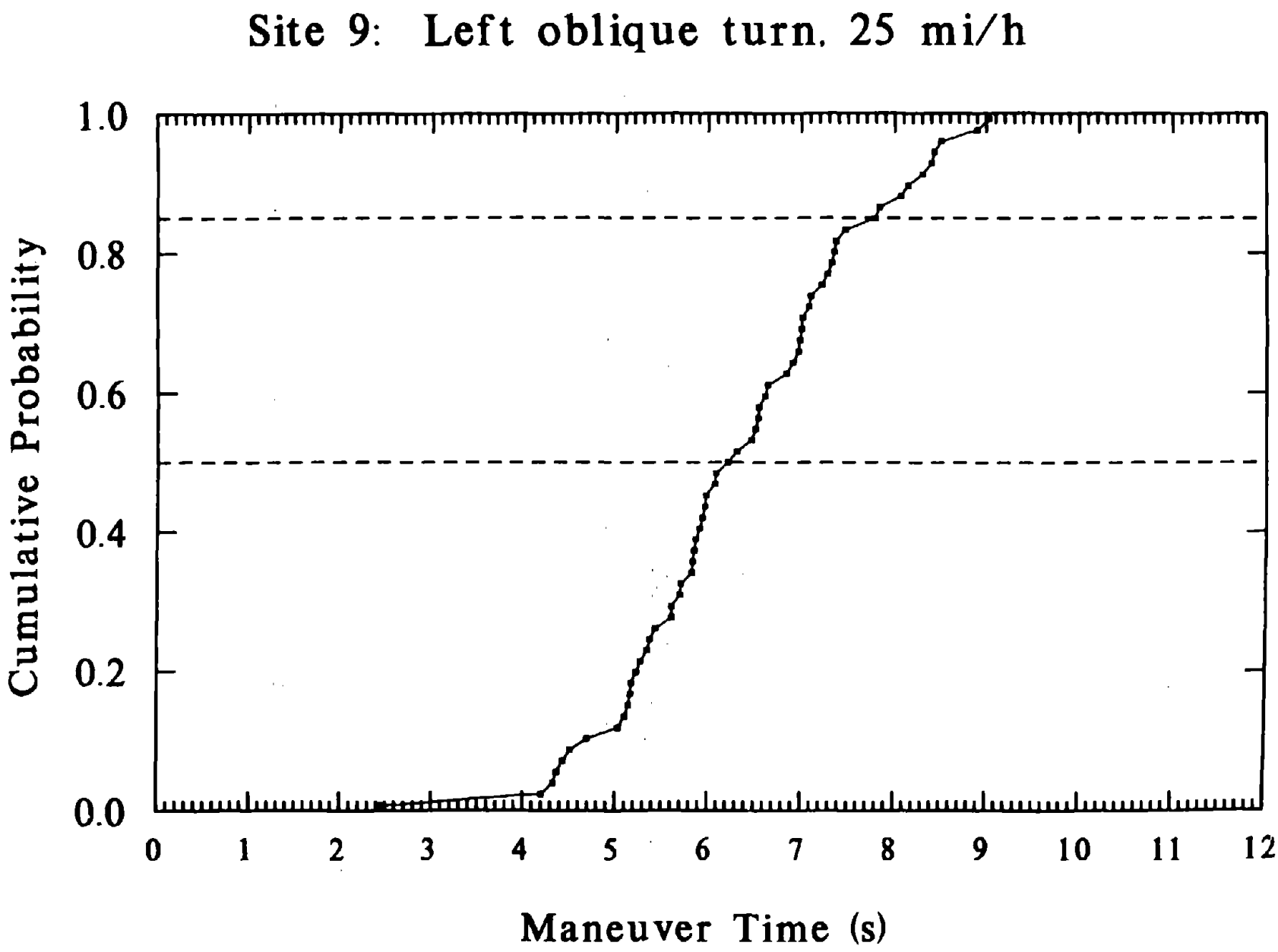


Figure 50. Cumulative frequency plots for site 9: through, divided, 55 mi/h, maneuver time(s).

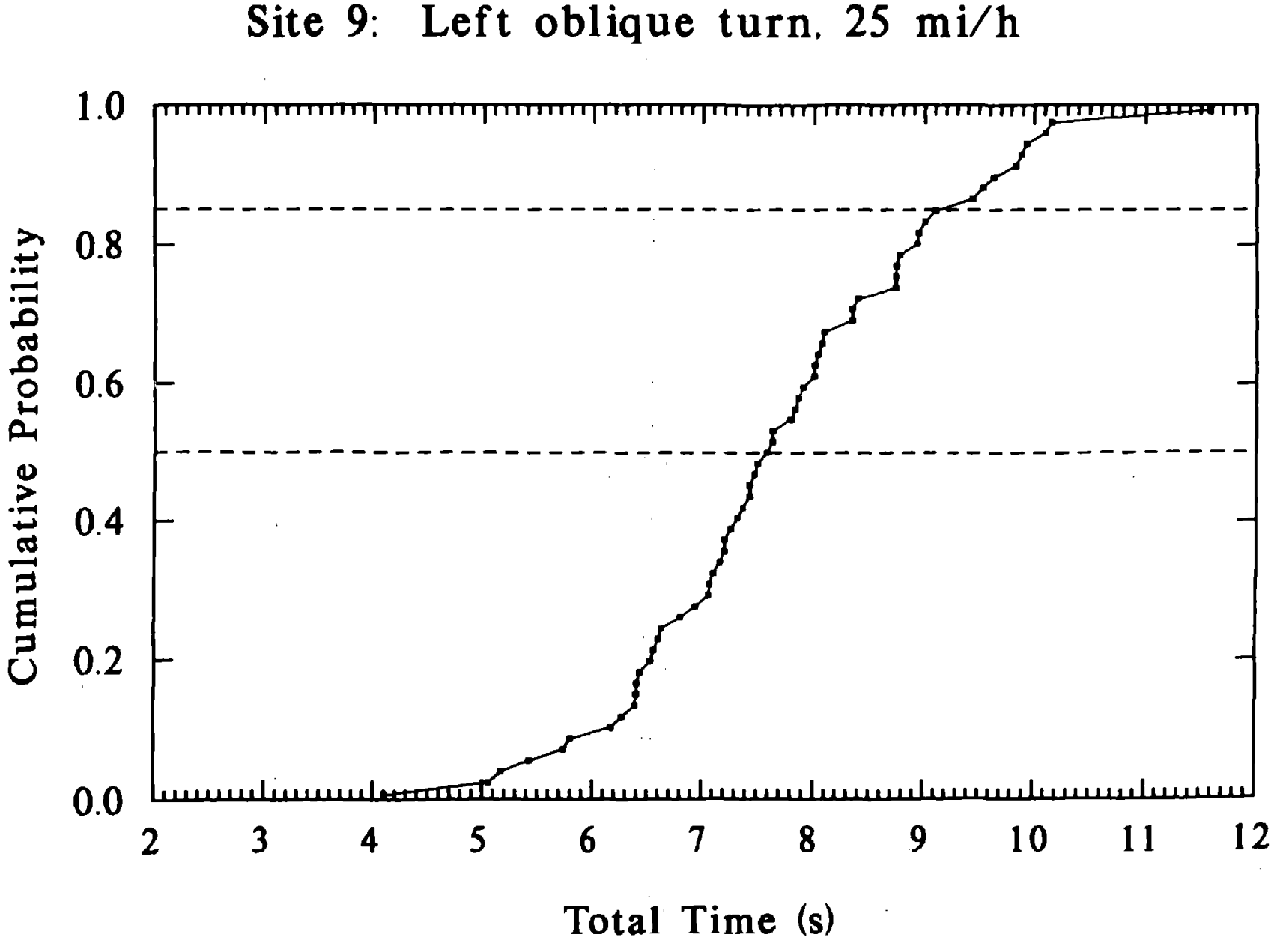


Figure 51. Cumulative frequency plots for site 9: through, divided, 55 mi/h, total time(s).

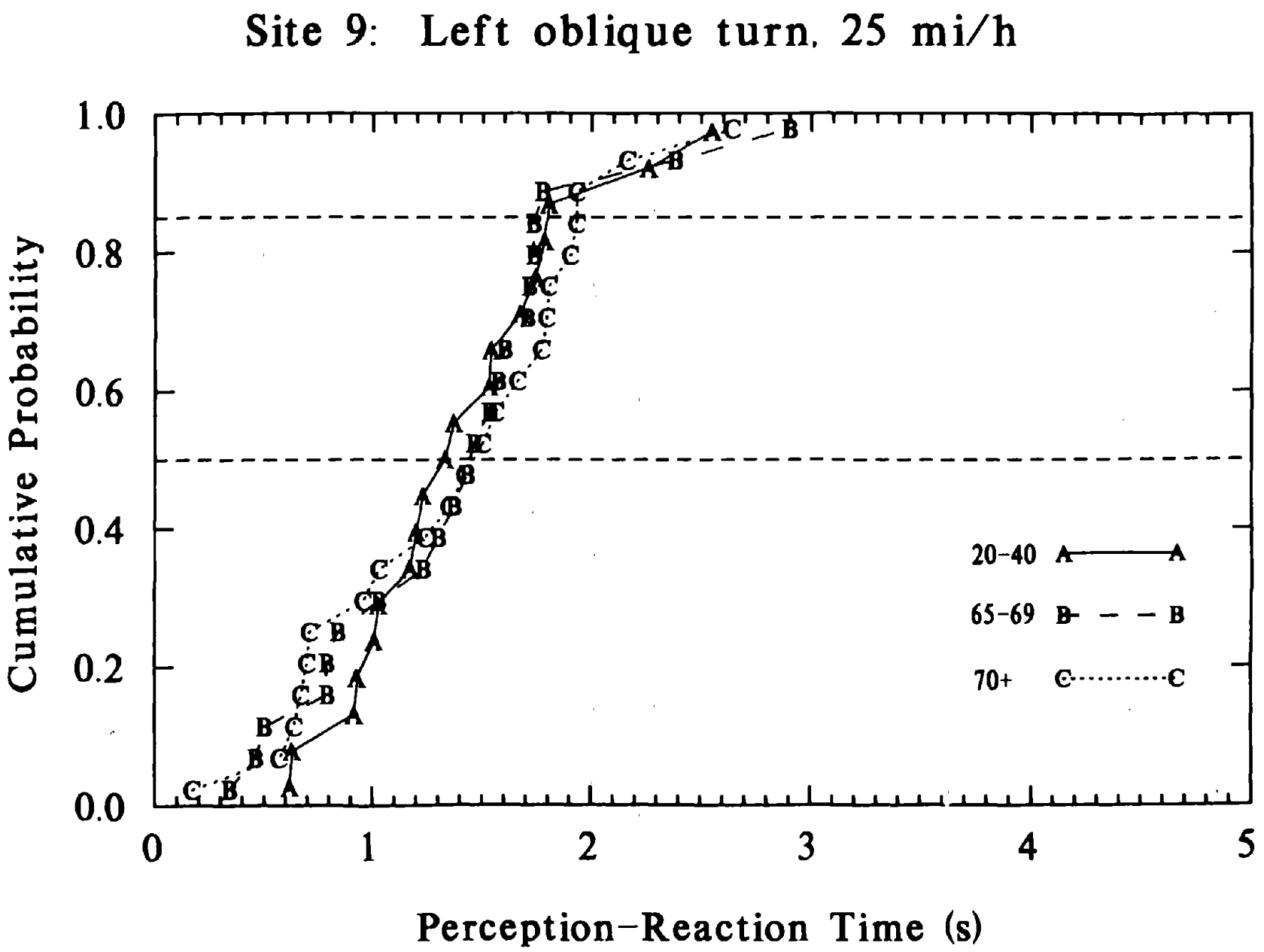


Figure 52. Cumulative frequency plots for site 9: through, divided, 55 mi/h, perception-reaction time(s), by age.

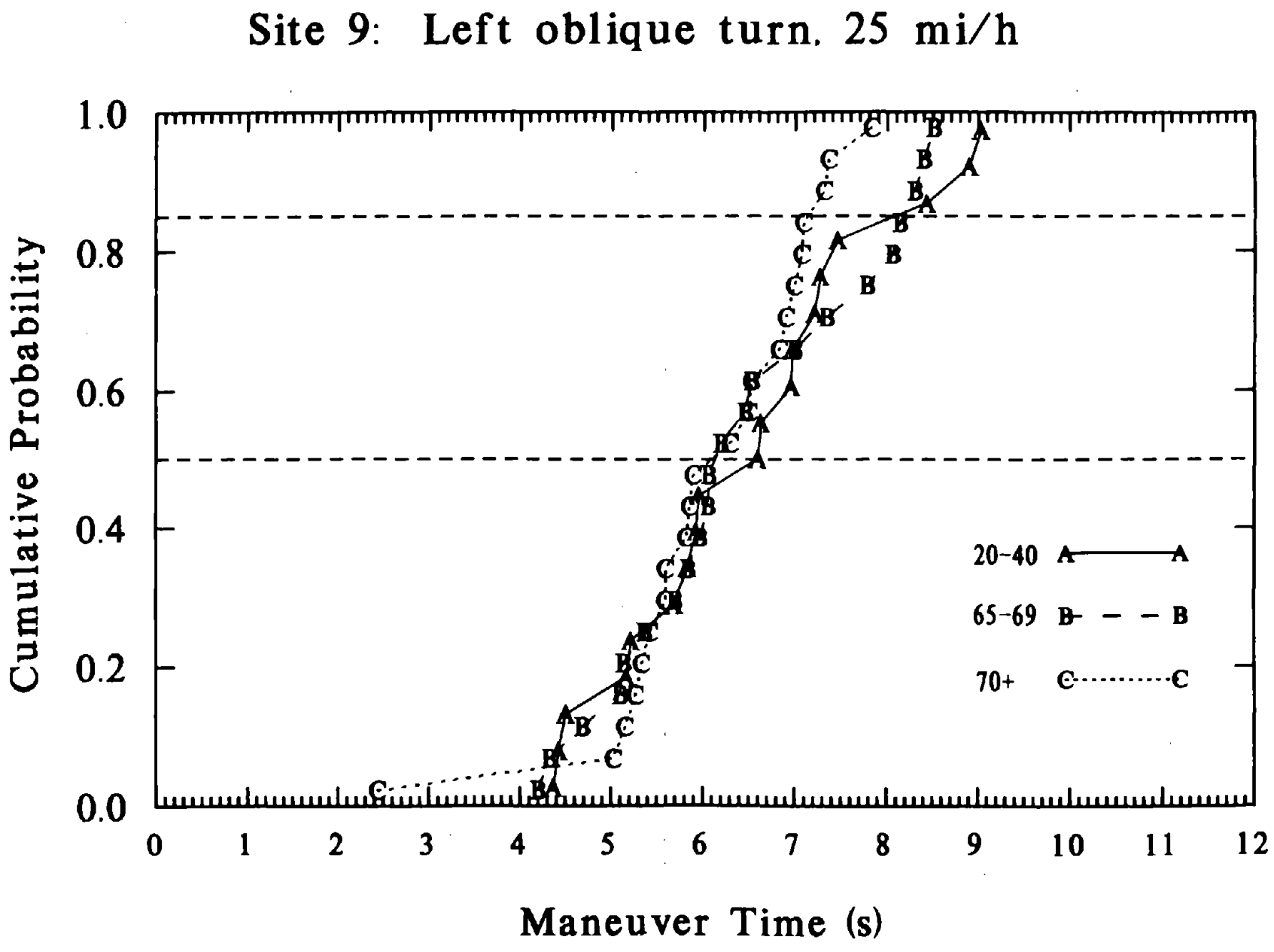


Figure 53. Cumulative frequency plots for site 9: through, divided, 55 mi/h, maneuver time(s), by age.

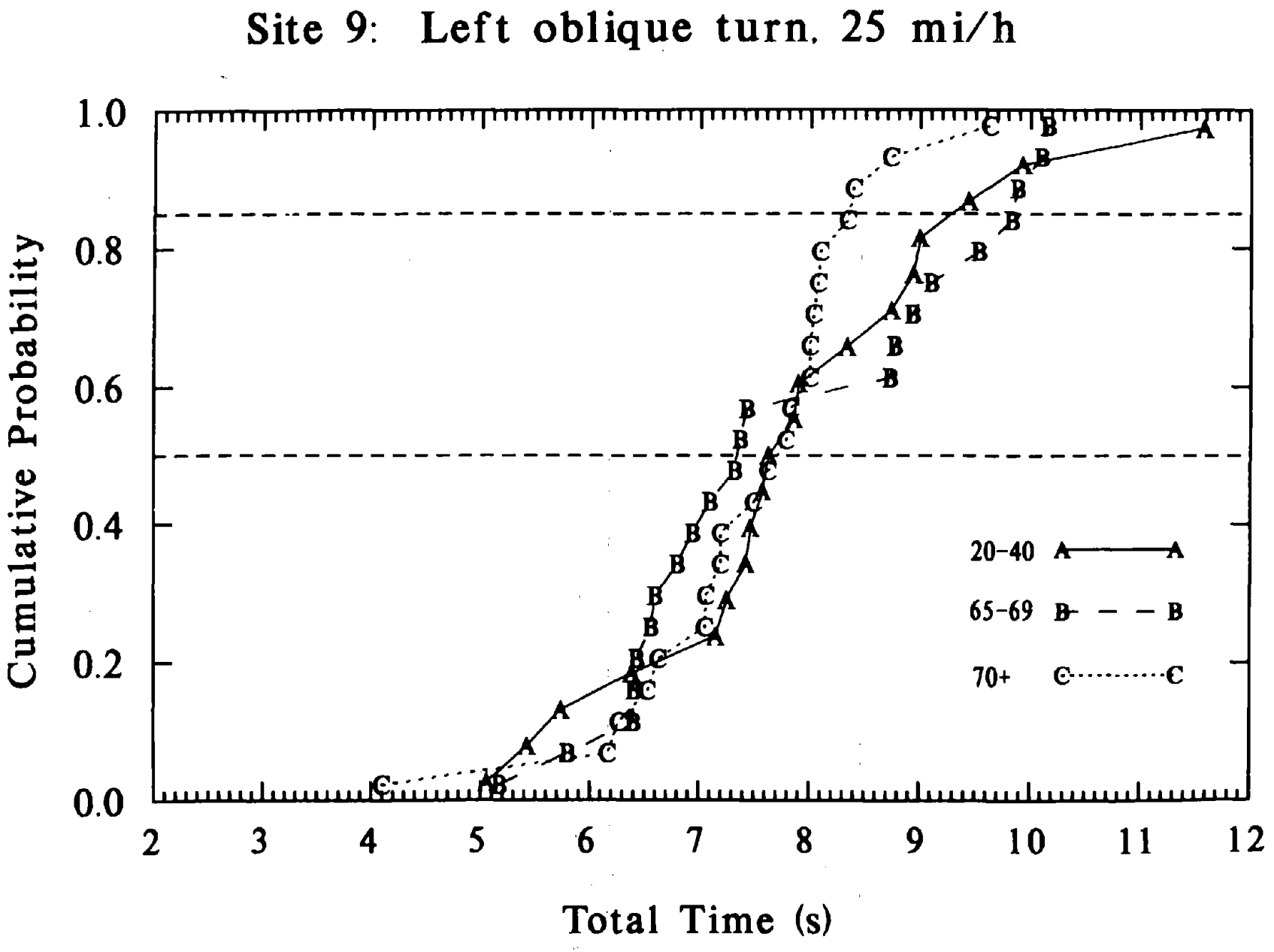


Figure 54. Cumulative frequency plots for site 9: through, divided, 55 mi/h, total time(s), by age.

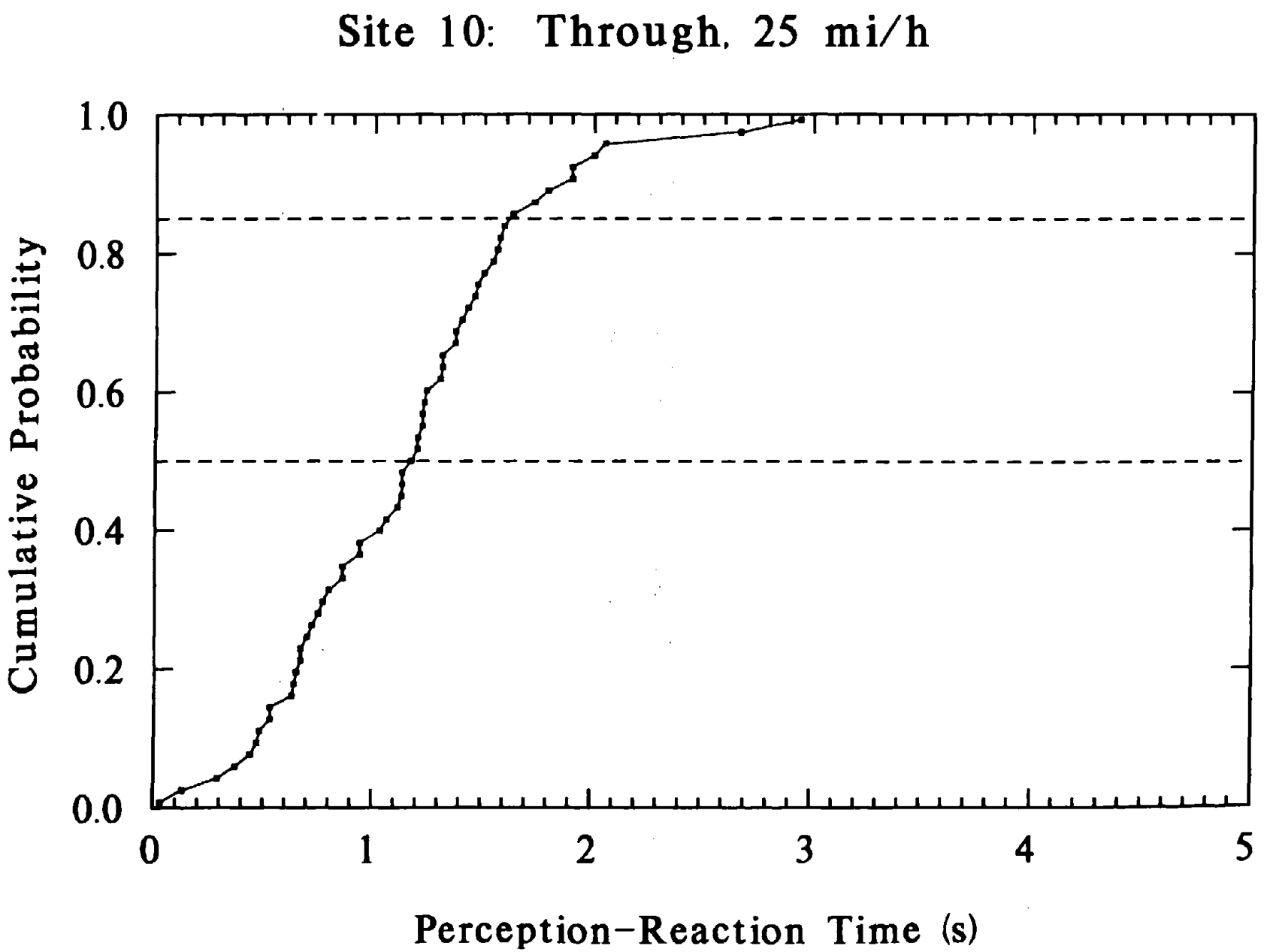


Figure 55. Cumulative frequency plots for site 10: through, divided, 55 mi/h, perception-reaction time(s).

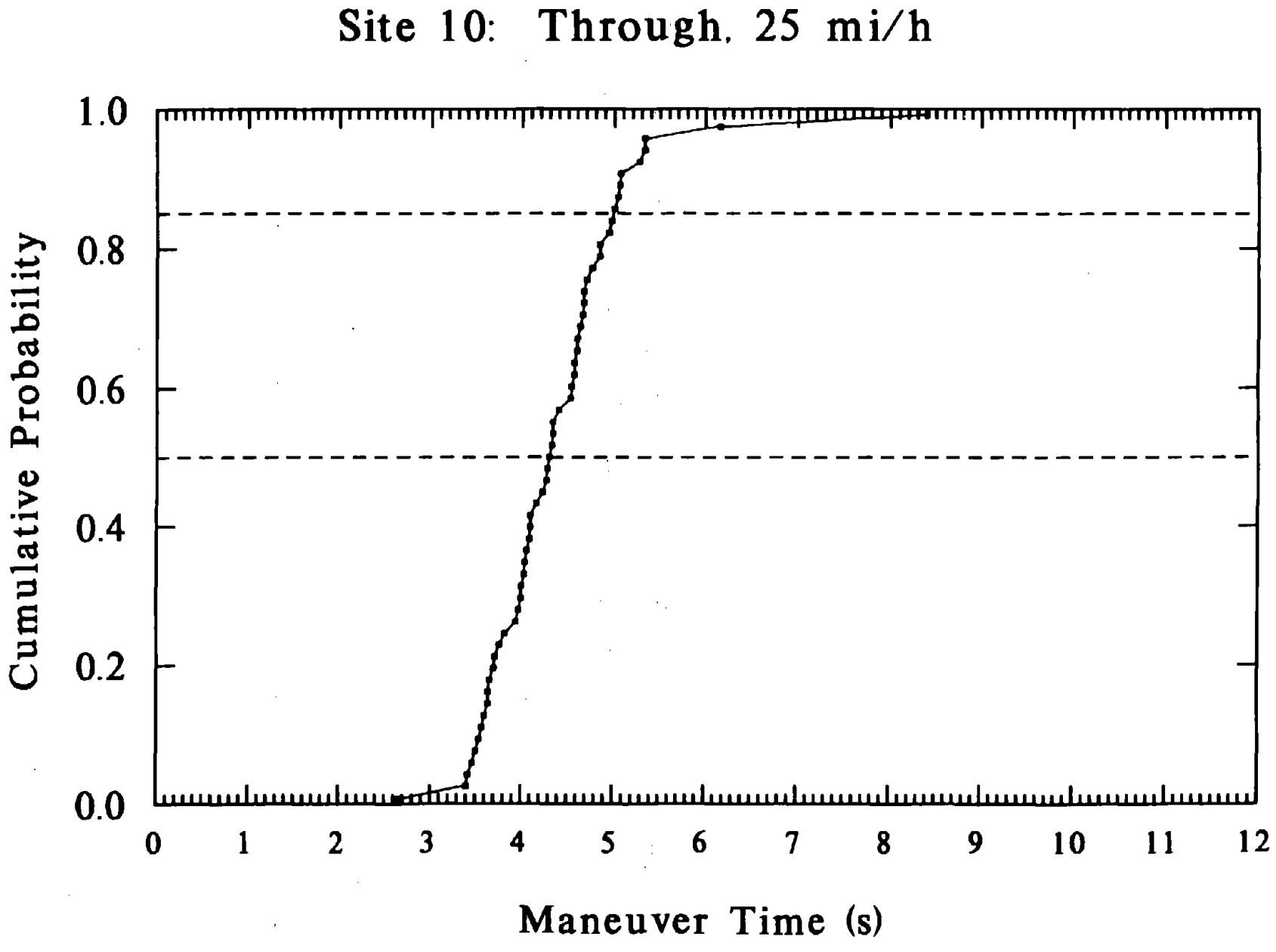


Figure 56. Cumulative freguency plots for site 10: through, divided, 55 mi/h, maneuver timc(s).

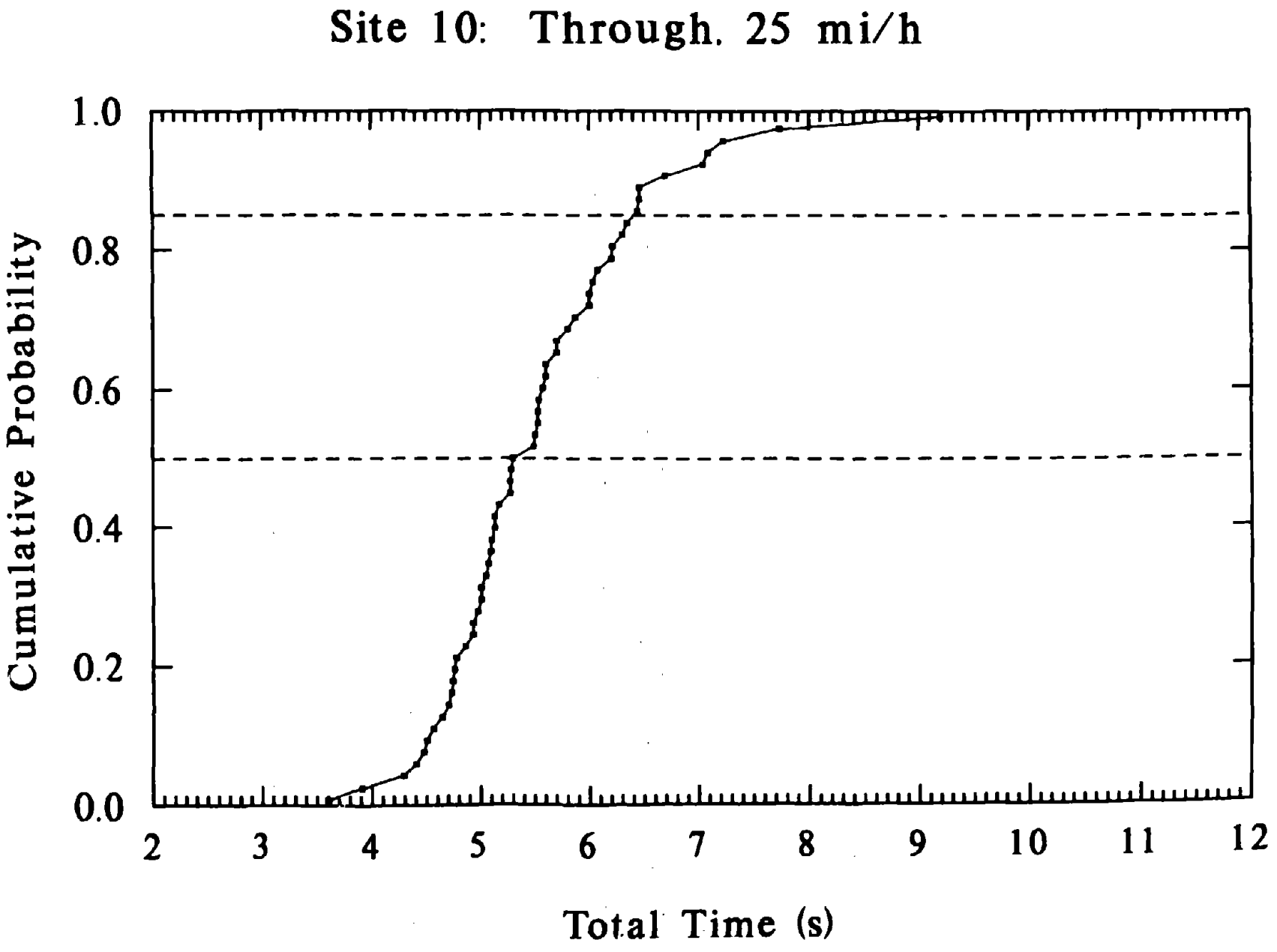


Figure 57. Cumulative frequency plots for site 10: through, divided, 55 mi/h, total time(s).

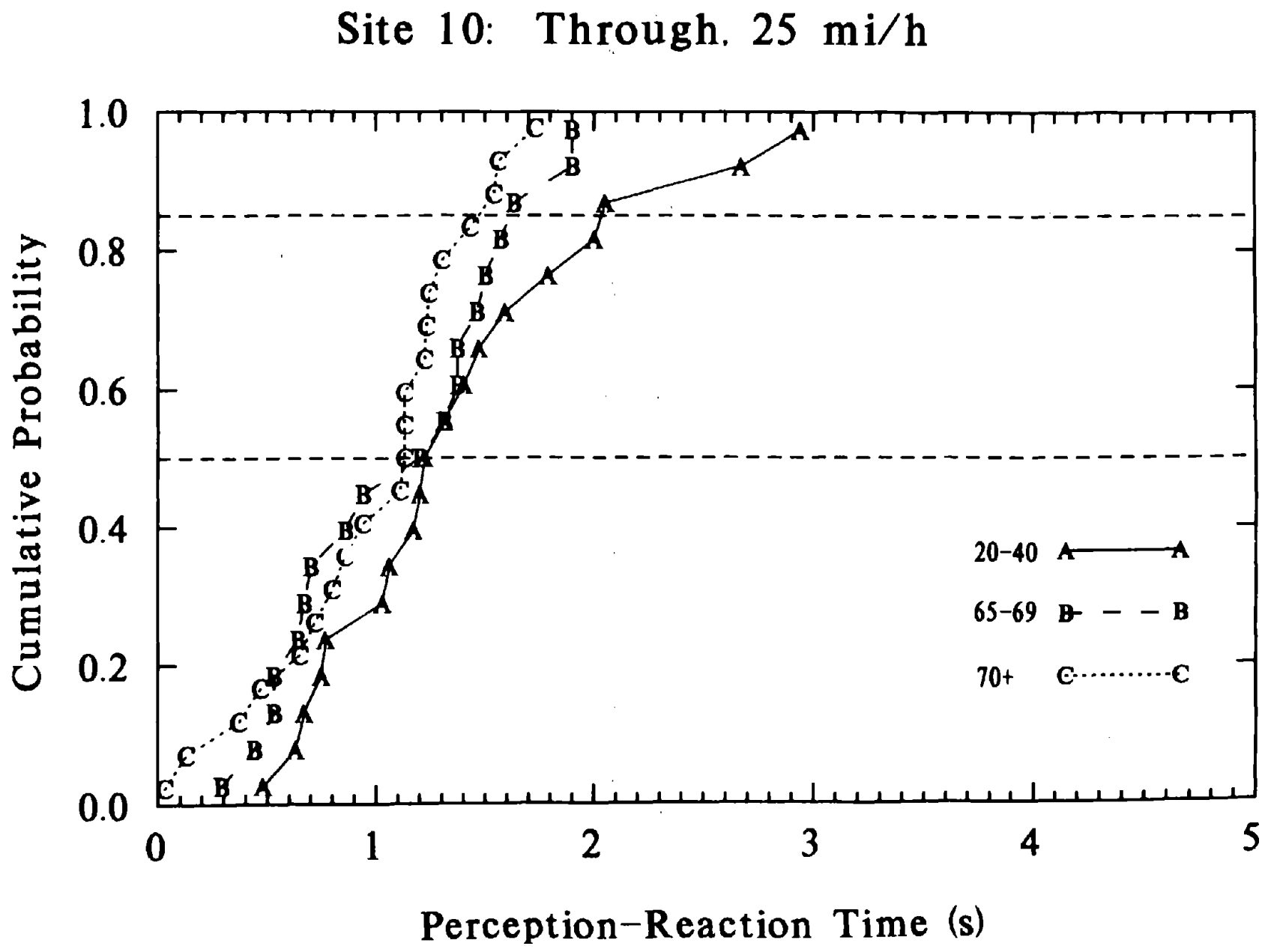


Figure 58. Cumulative frequency plots for site 10: through, divided, 55 mi/h, perception-reaction time(s), by age.

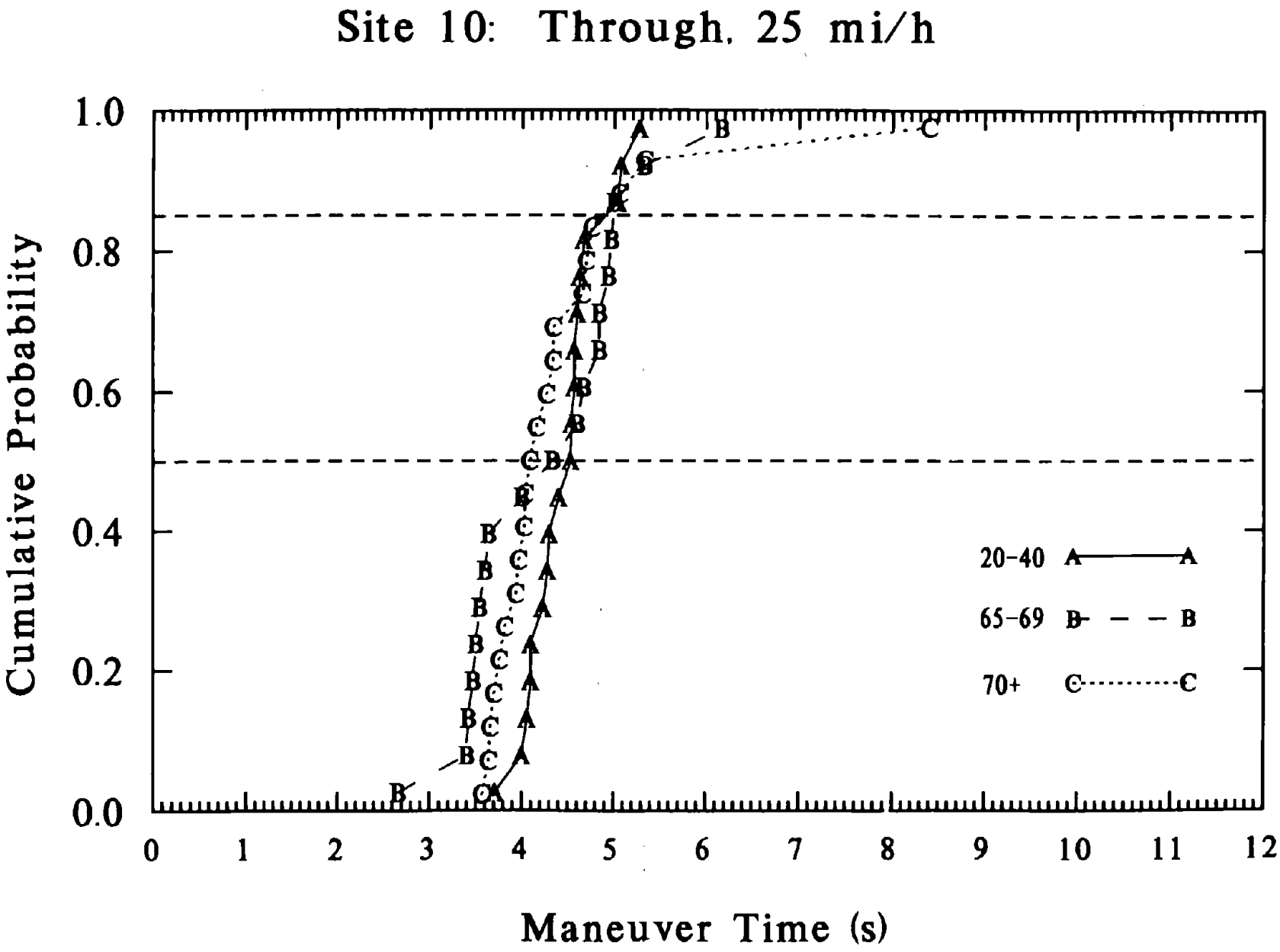


Figure 59. Cumulative frequency plots for site 10: through, divided, 55 mi/h, maneuver time(s), by age.

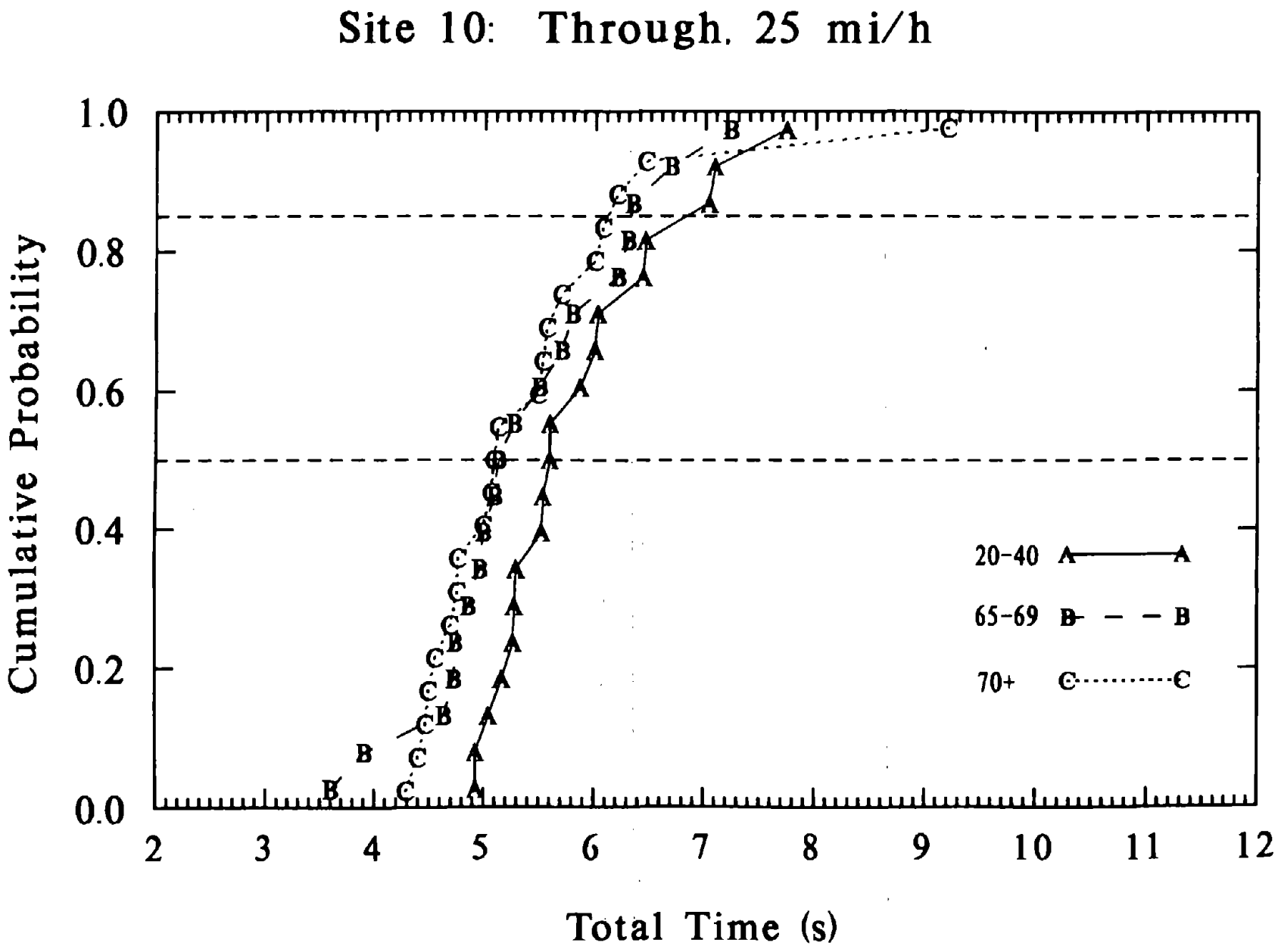


Figure 60. Cumulative frequency plots for site 10: through, divided, 55 mi/h, total time(s), by age.

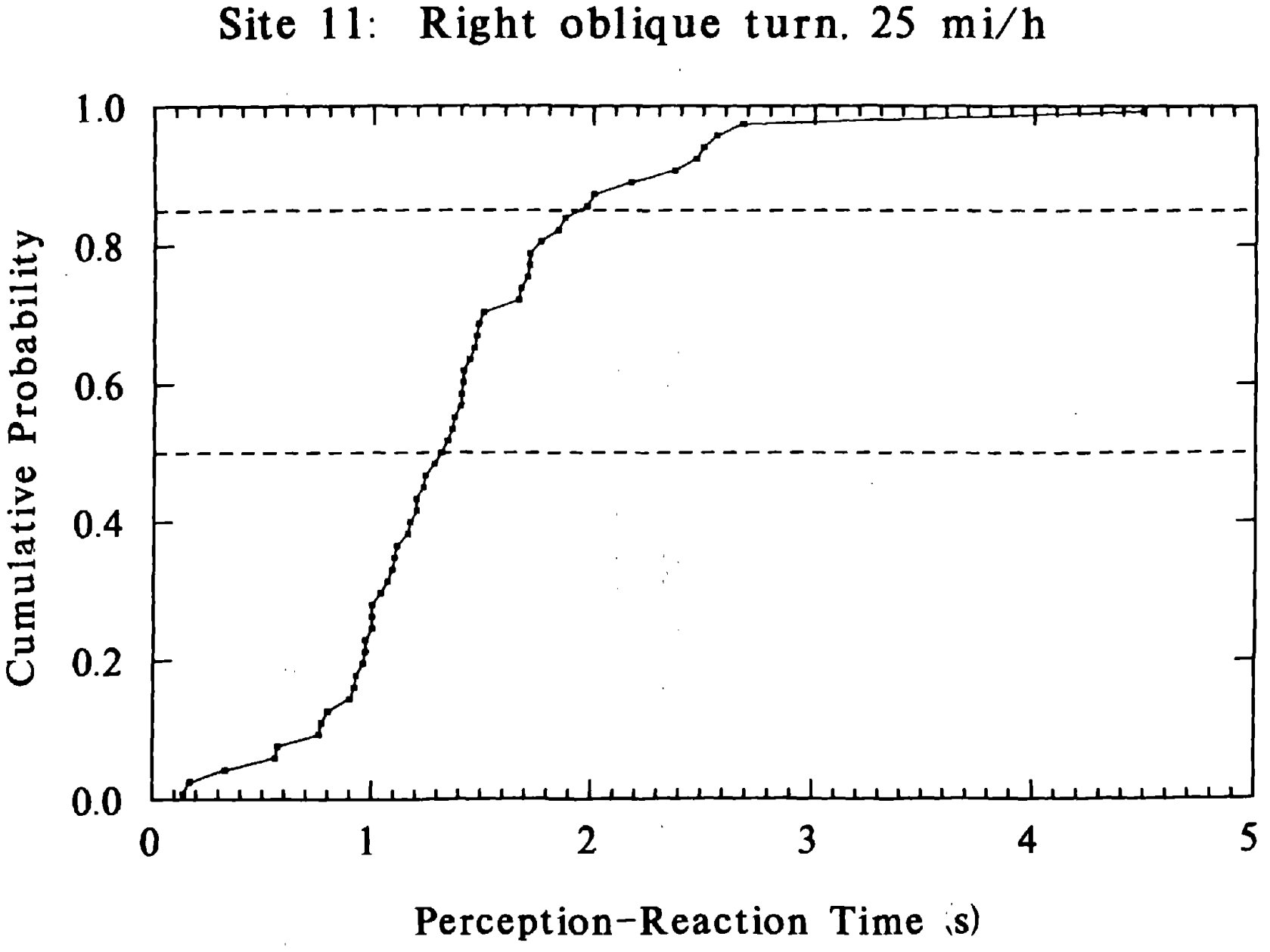


Figure 61. Cumulative frequency plots for site 11 through, divided, 55 mi/h, perception-reaction time(s).

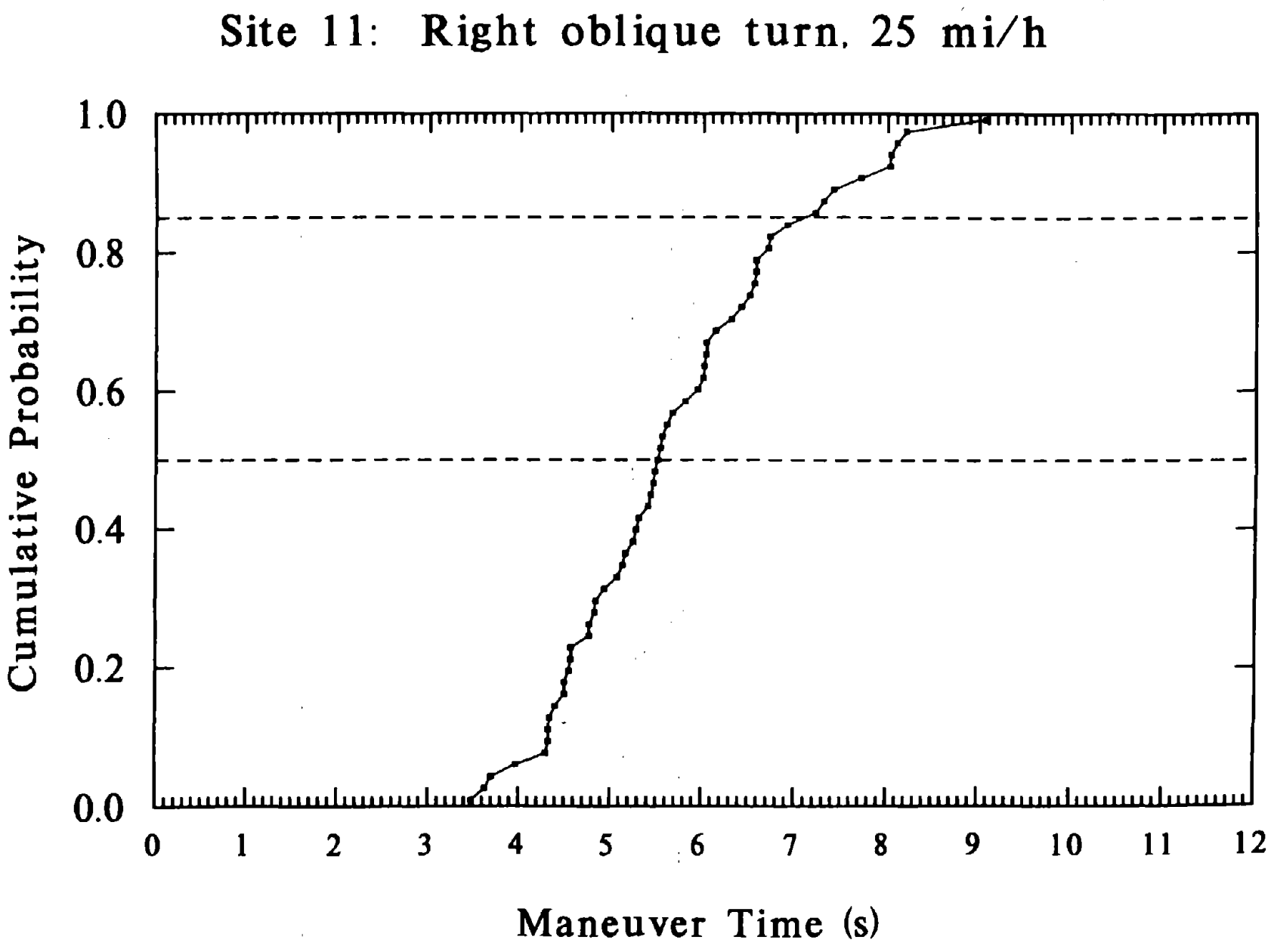


Figure 62. Cumulative frequency plots for site 11: through, divided, 55 mi/h, maneuver time(s).

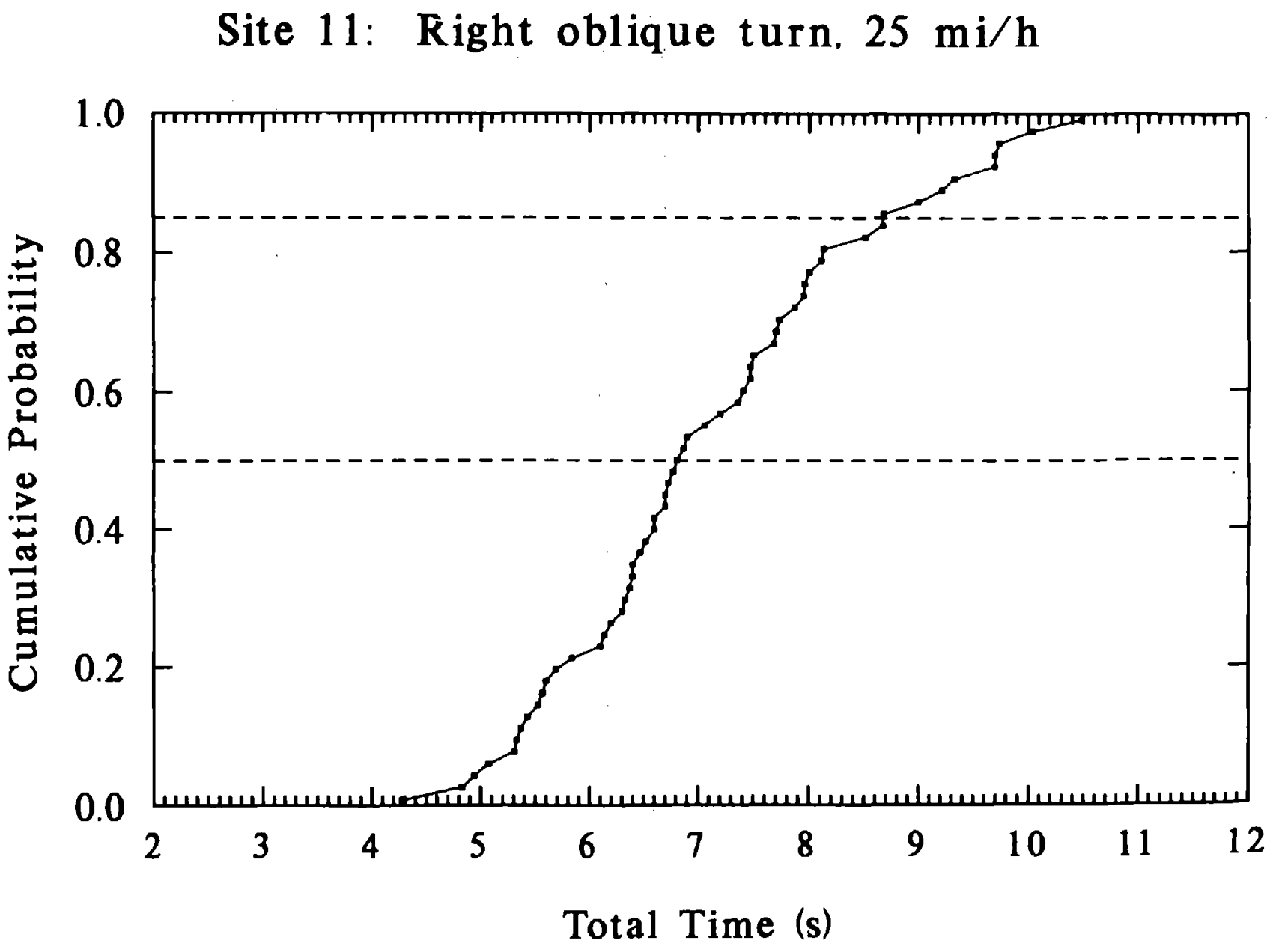


Figure 63. Cumulative frequency plots for site 11: through, divided, 55 mi/h, total time(s).

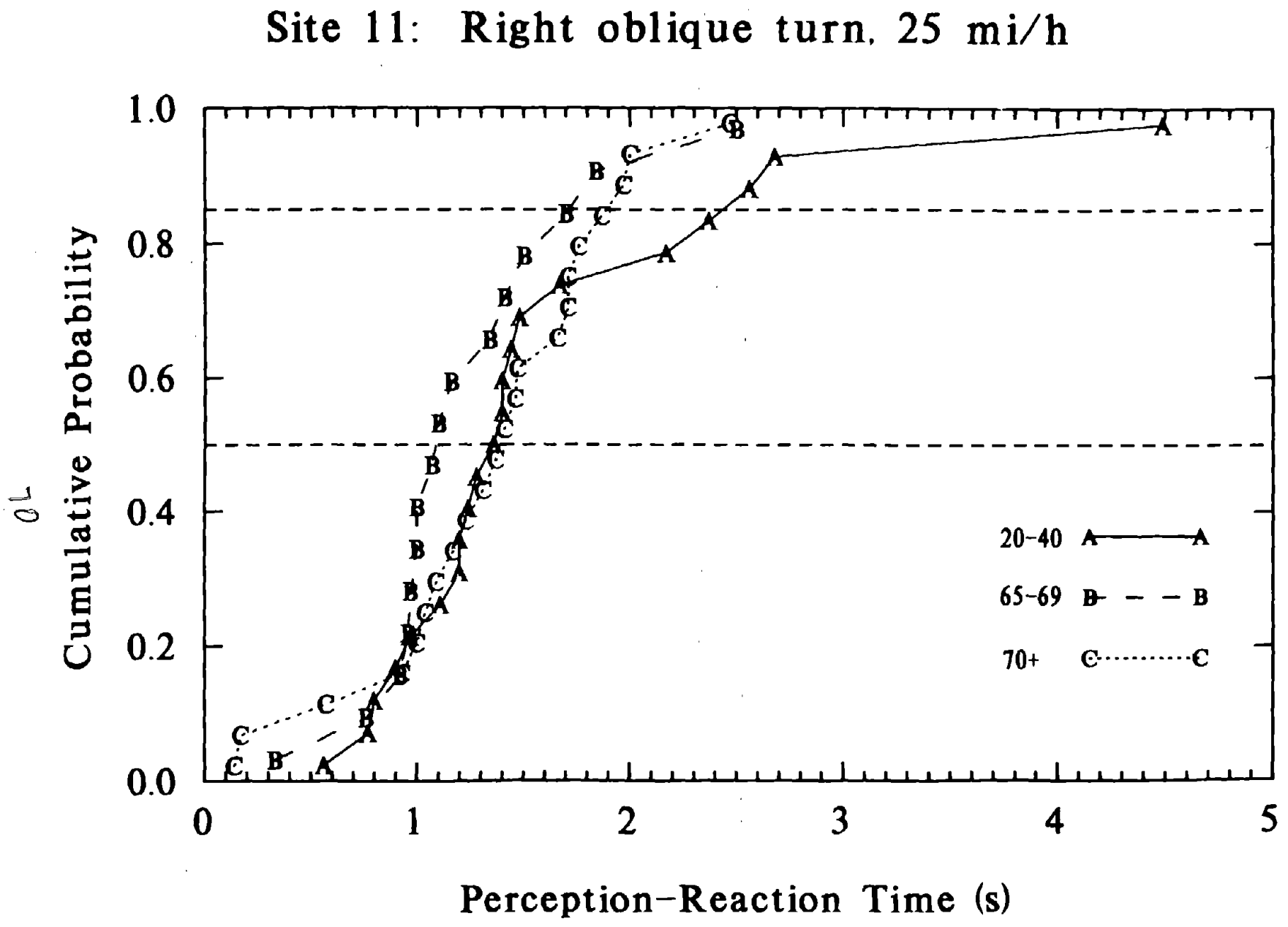


Figure 64. Cumulative frequency plots for site 11: through, divided, 55 mi/h, perception-reaction time(s), by age.

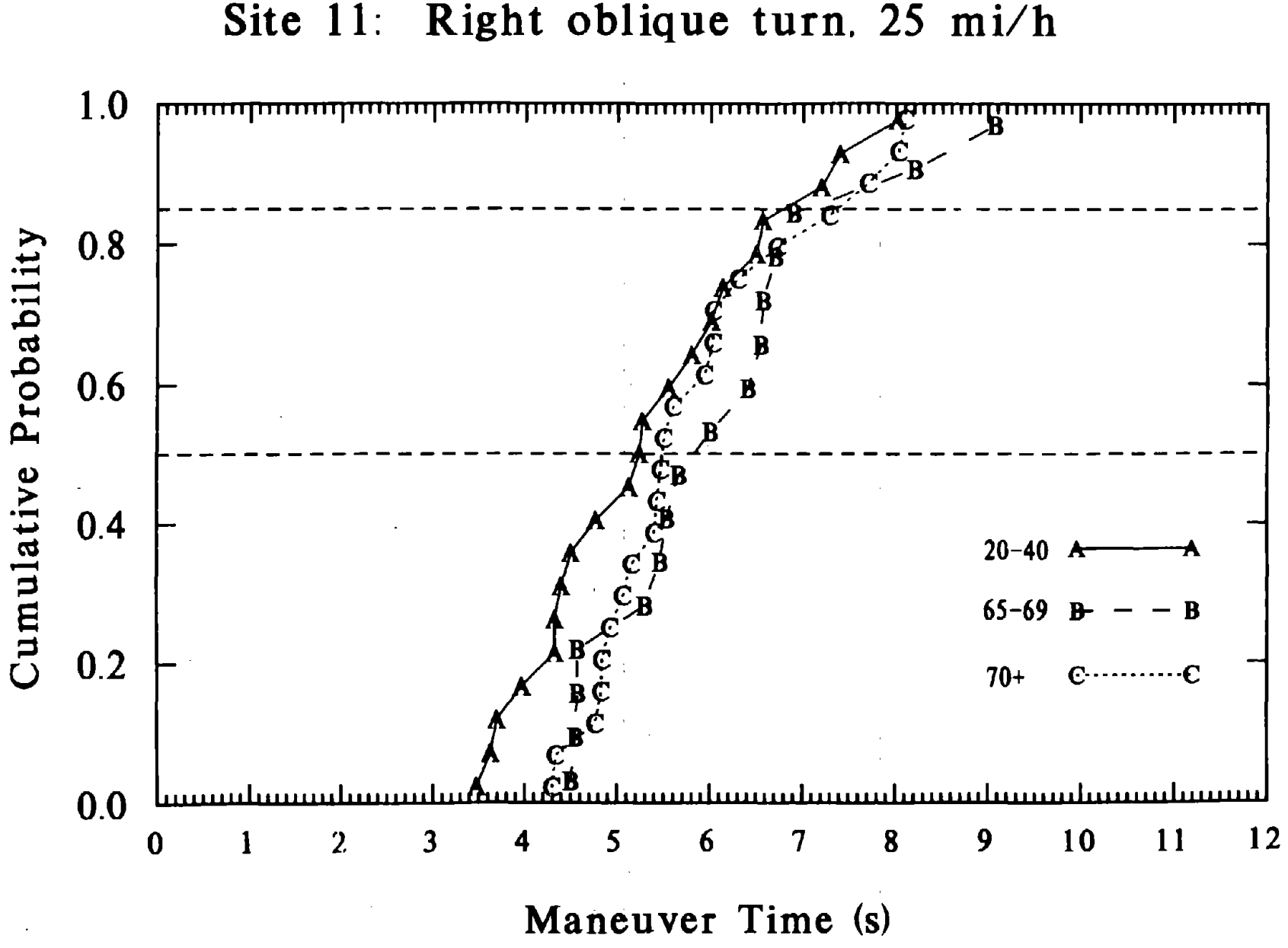


Figure 65. Cumulative frequency plots for site 11: through, divided, 55 mi/h, maneuver time(s), by age.

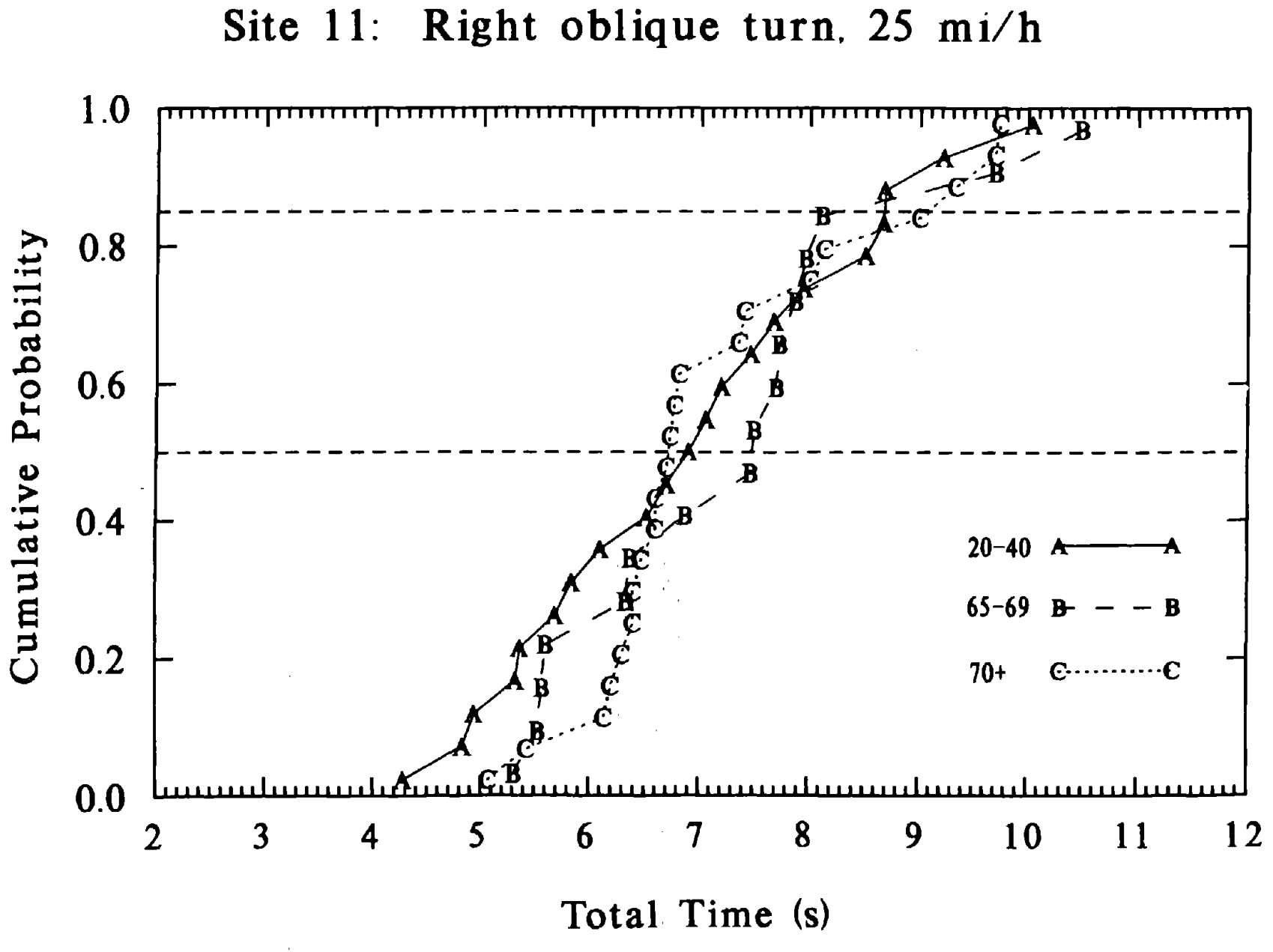


Figure 66. Cumulative frequency plots for site 11: through, divided, 55 mi/h, total time(s), by age.

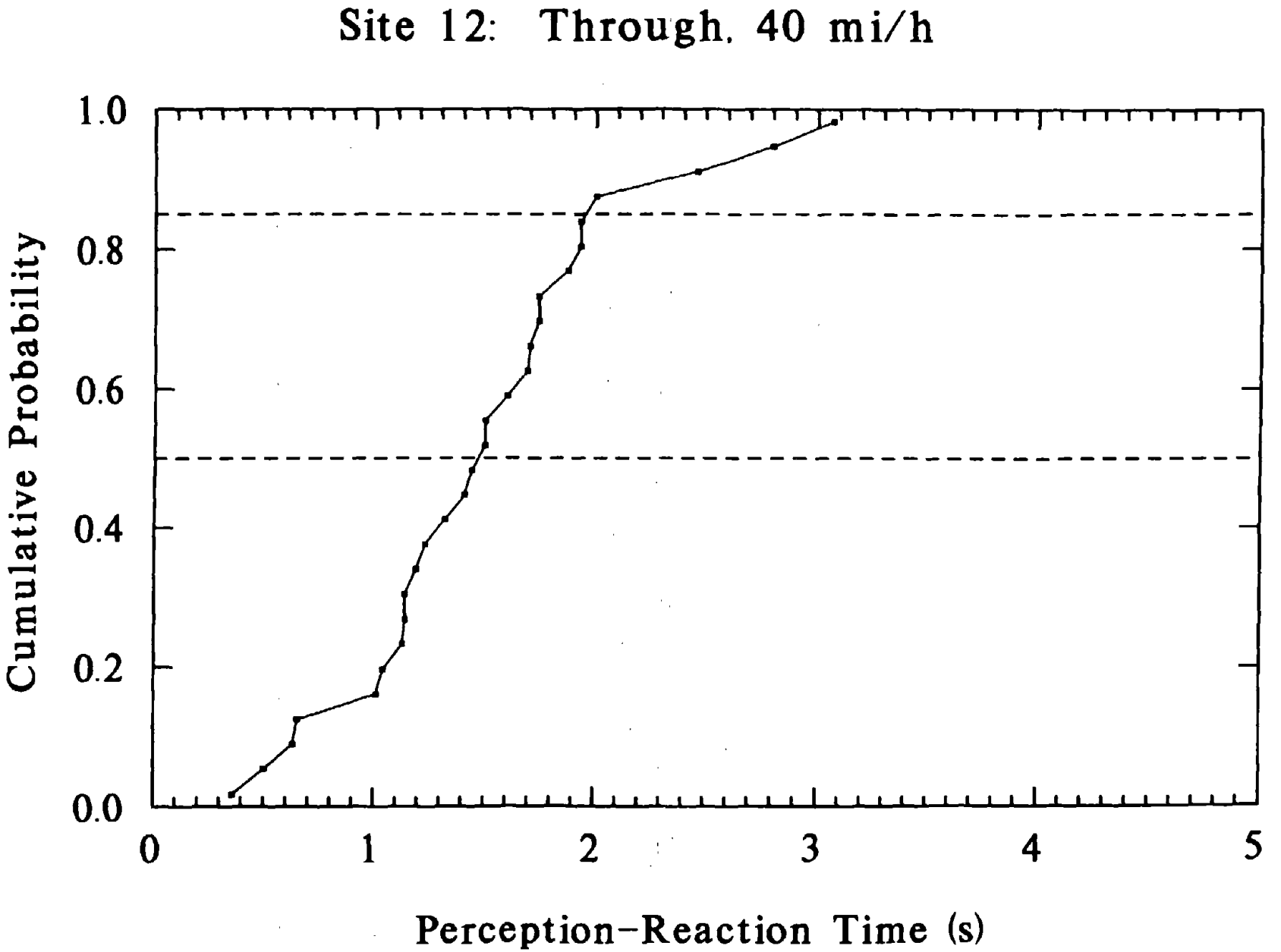


Figure 67. Cumulative frequency plots for site 12: through, divided, 55 mi/h, perception-reaction time(s).

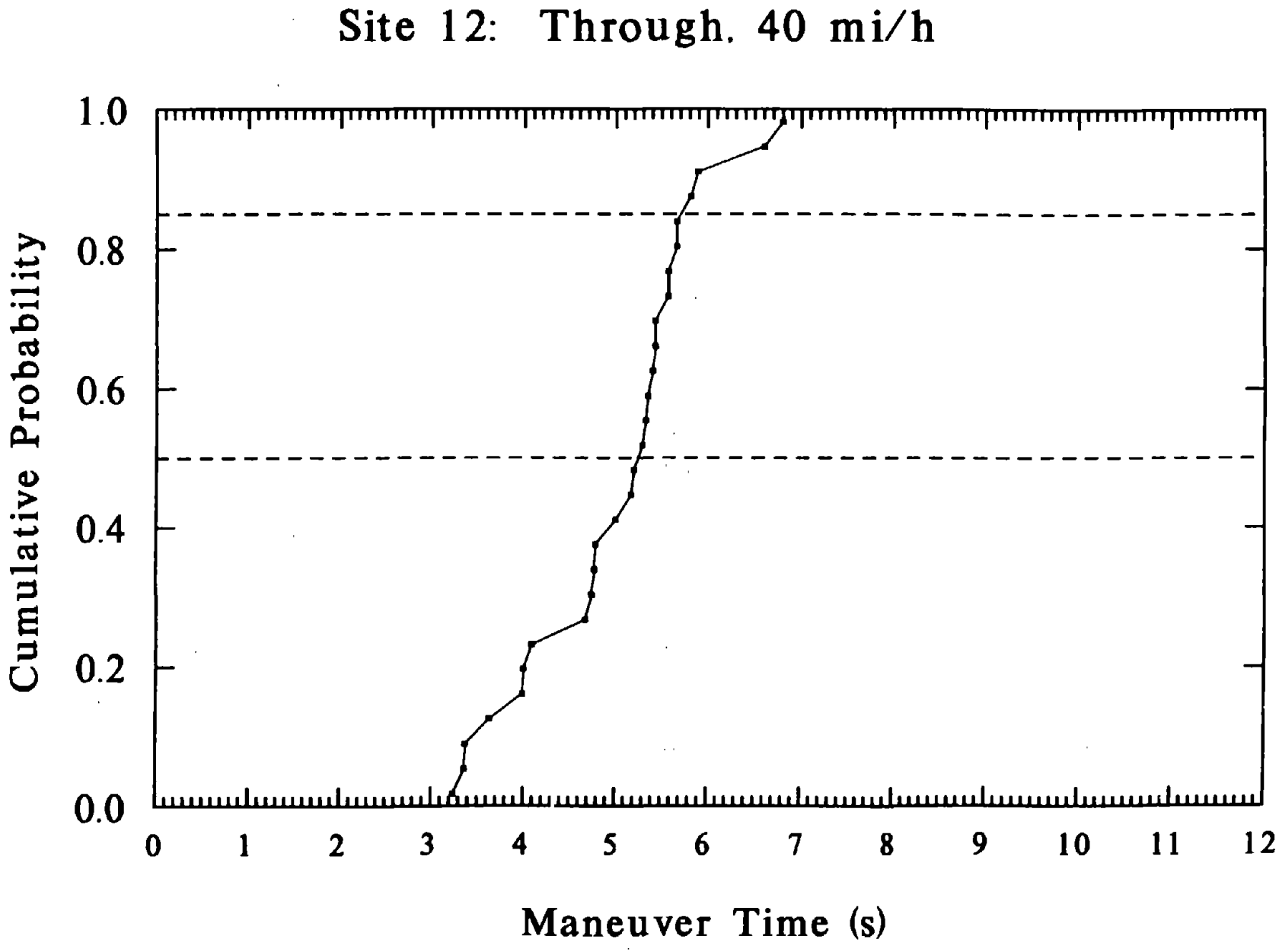


Figure 68. Cumulative frequency plots for site 12: through, divided, 55 mi/h, maneuver time(s).

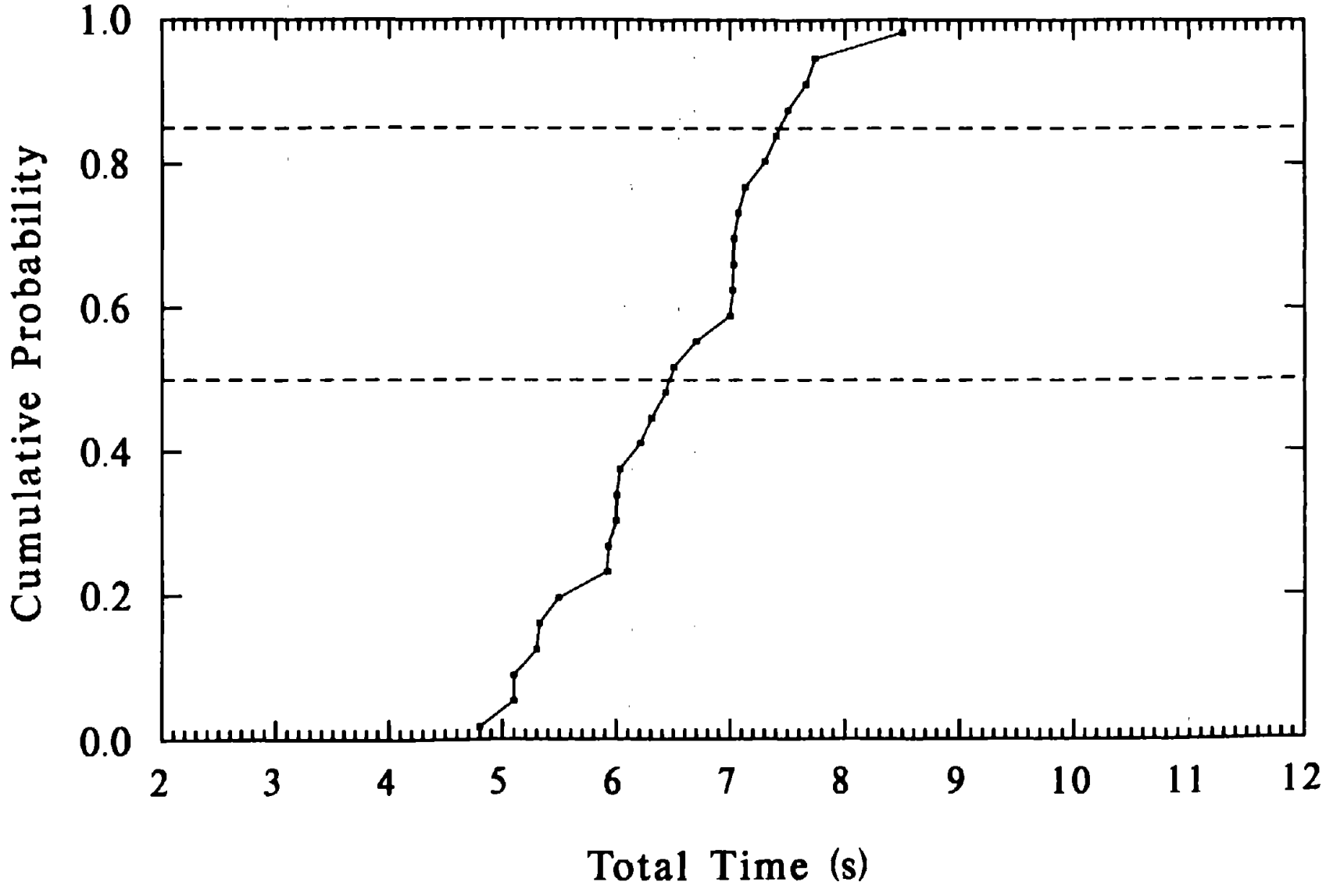


Figure 69. Cumulative frequency plots for site 12: through, divided, 55 mi/h, total time(s).

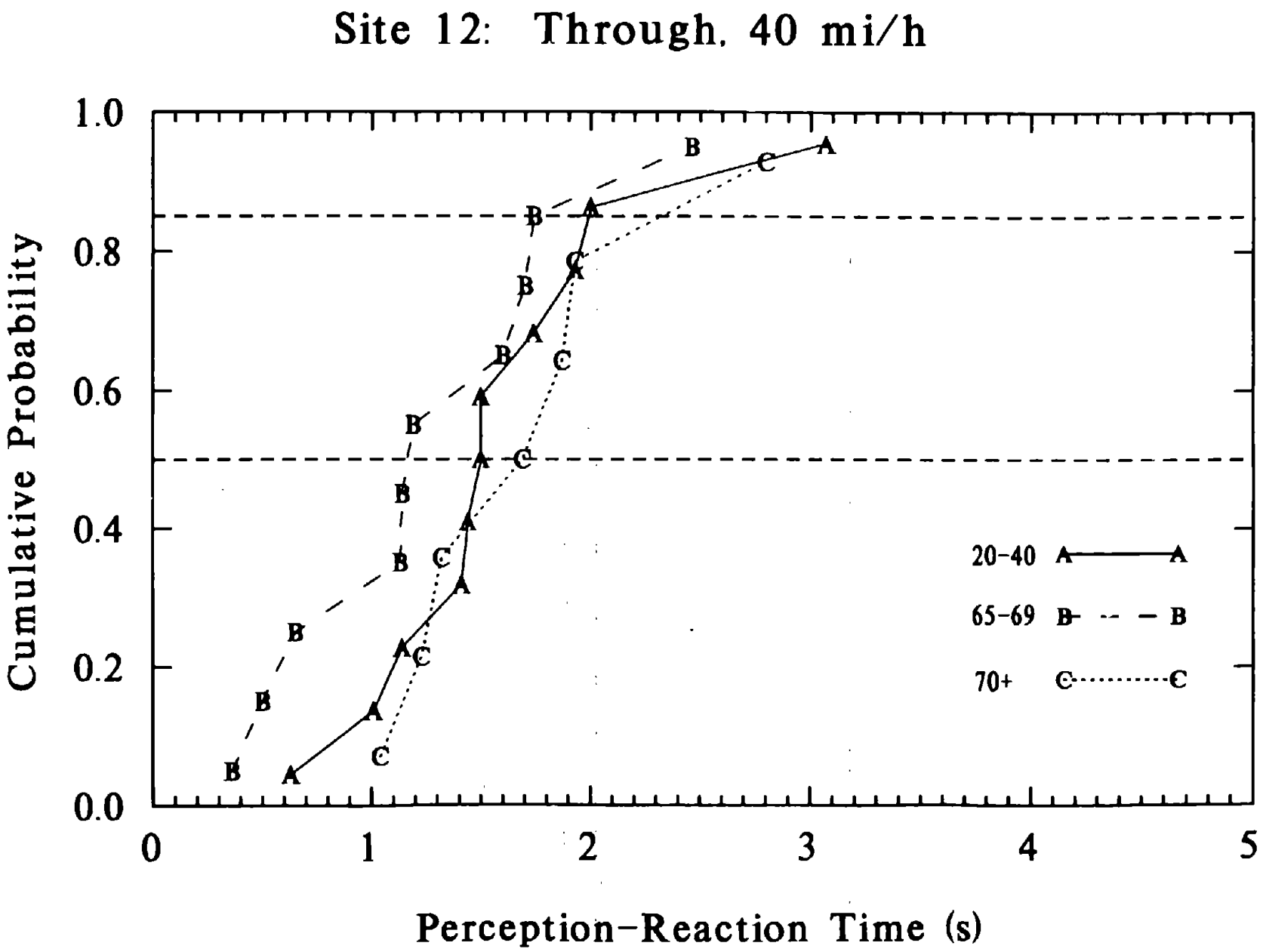


Figure 70. Cumulative frequency plots for site 12: through, divided, 55 mi/h, perception-reaction time(s), by age.

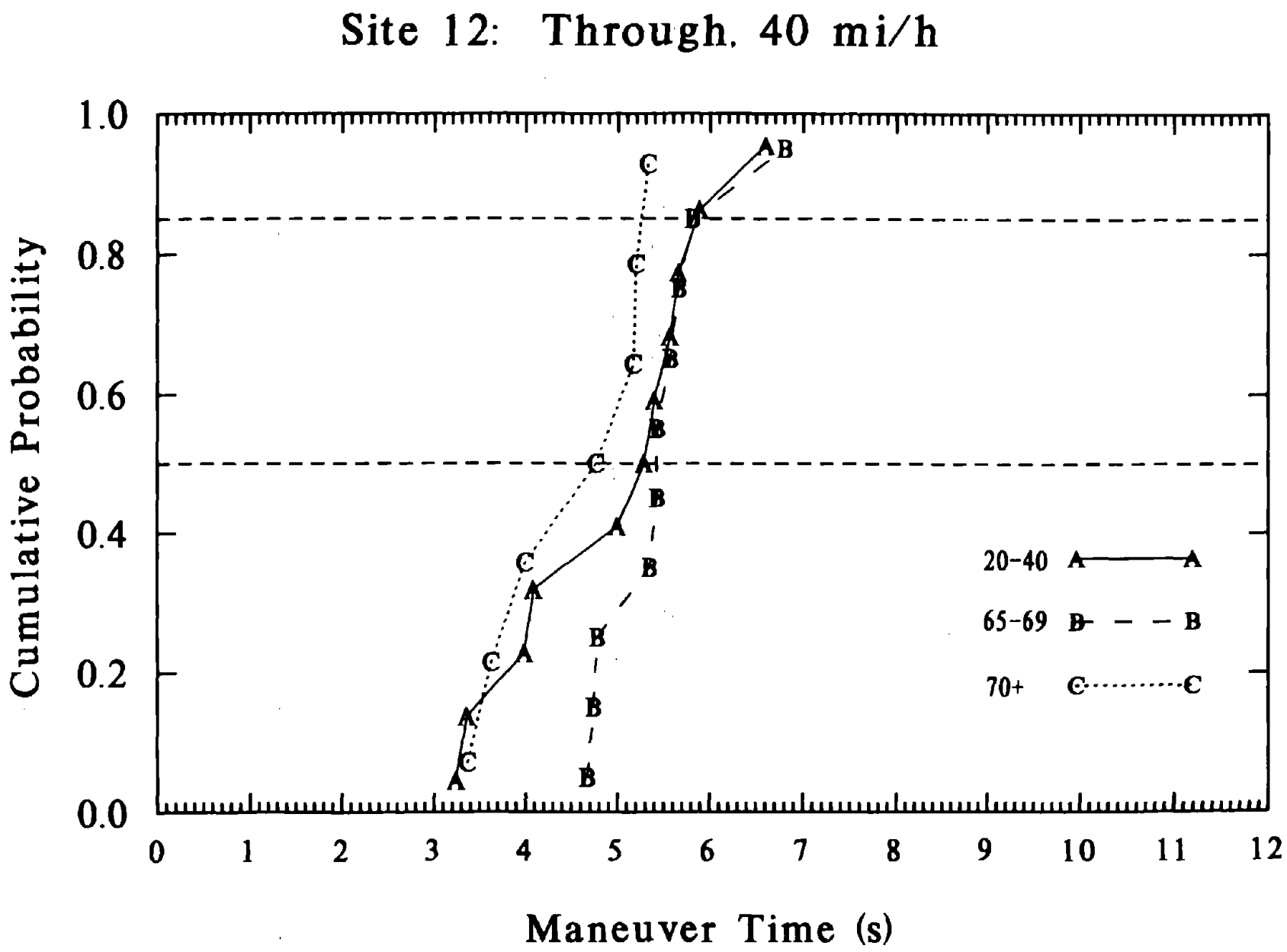


Figure 71. Cumulative frequency plots for site 12: through, divided, 55 mi/h, maneuver time(s), by age.

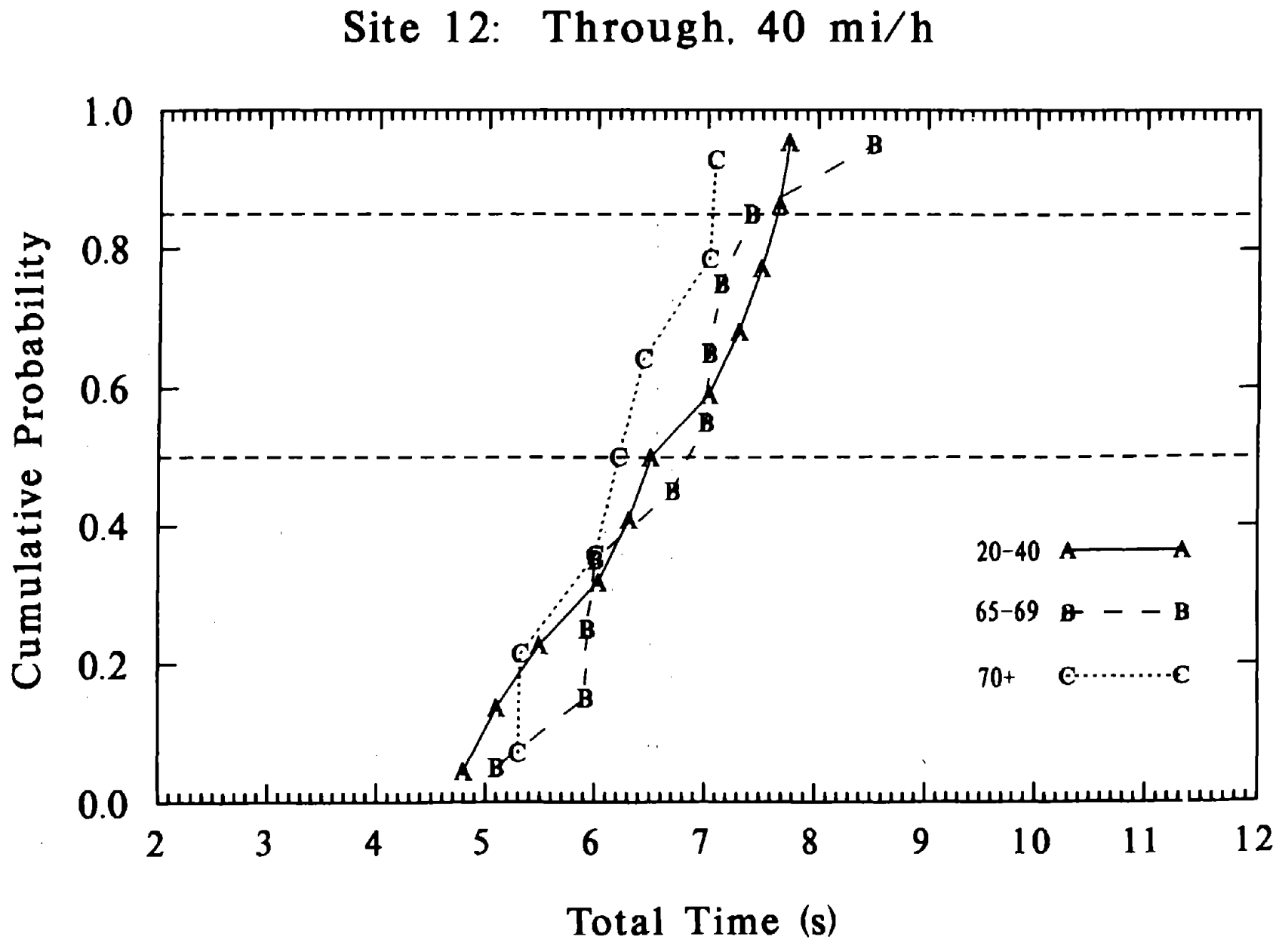


Figure 72. Cumulative frequency plots for site 12: through, divided, 55 mi/h, total time(s), by age.

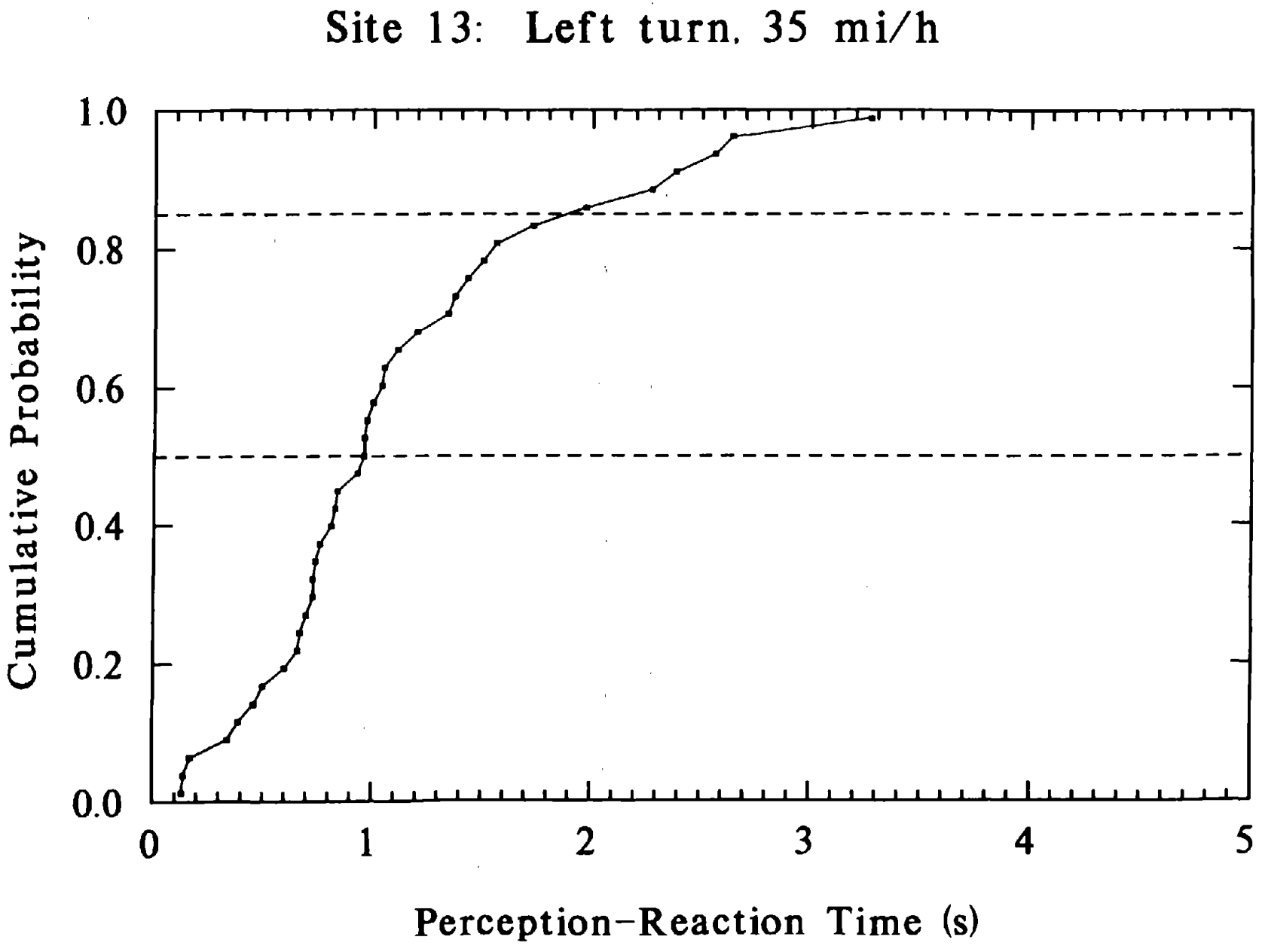


Figure 73. Cumulative frequency plots for site 13: through, divided, 55 mi/h, perception-reaction time(s).

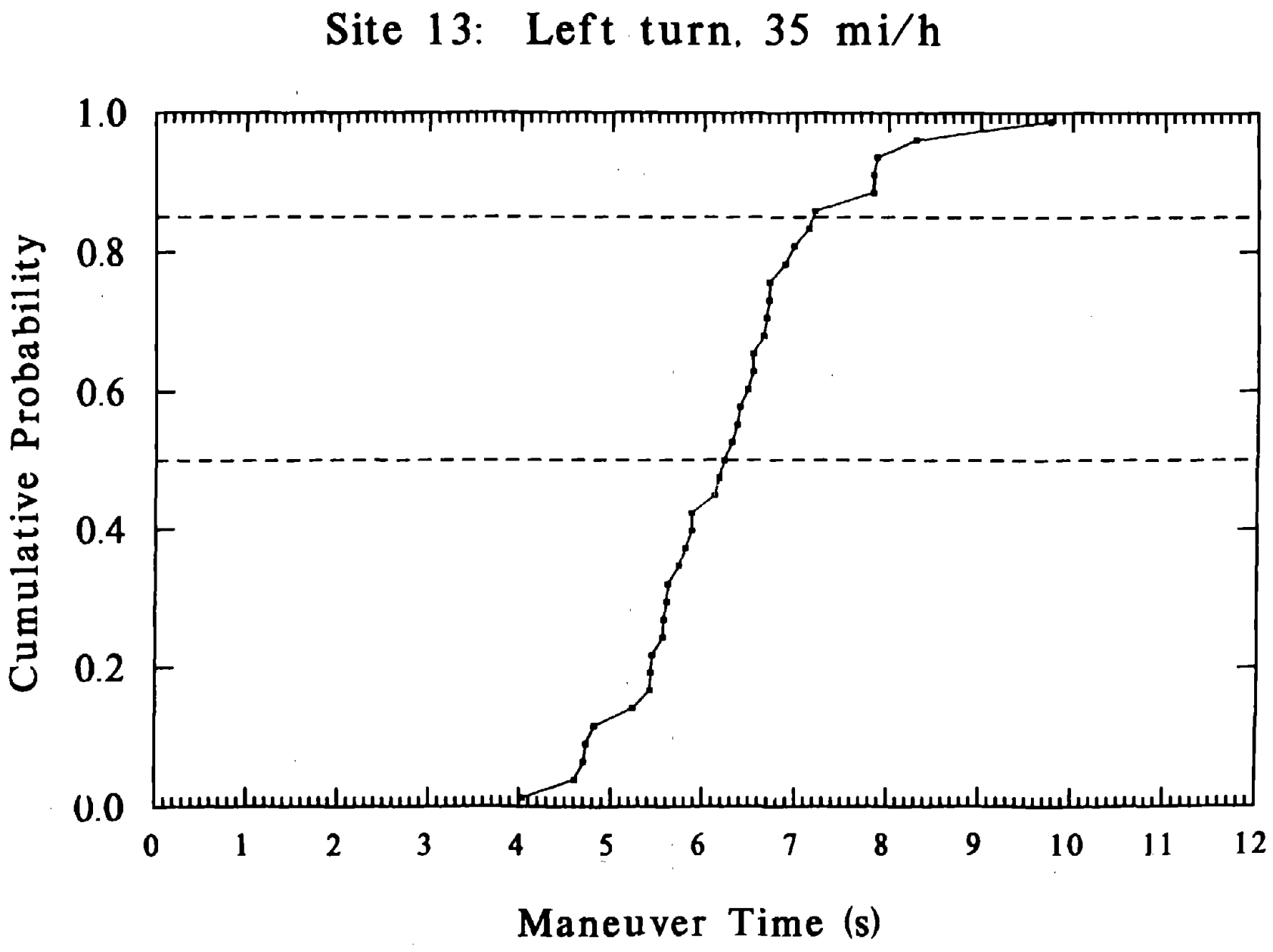


Figure 74. Cumulative frequency plots for site 13: through, divided, 55 mi/h, maneuver time(s).

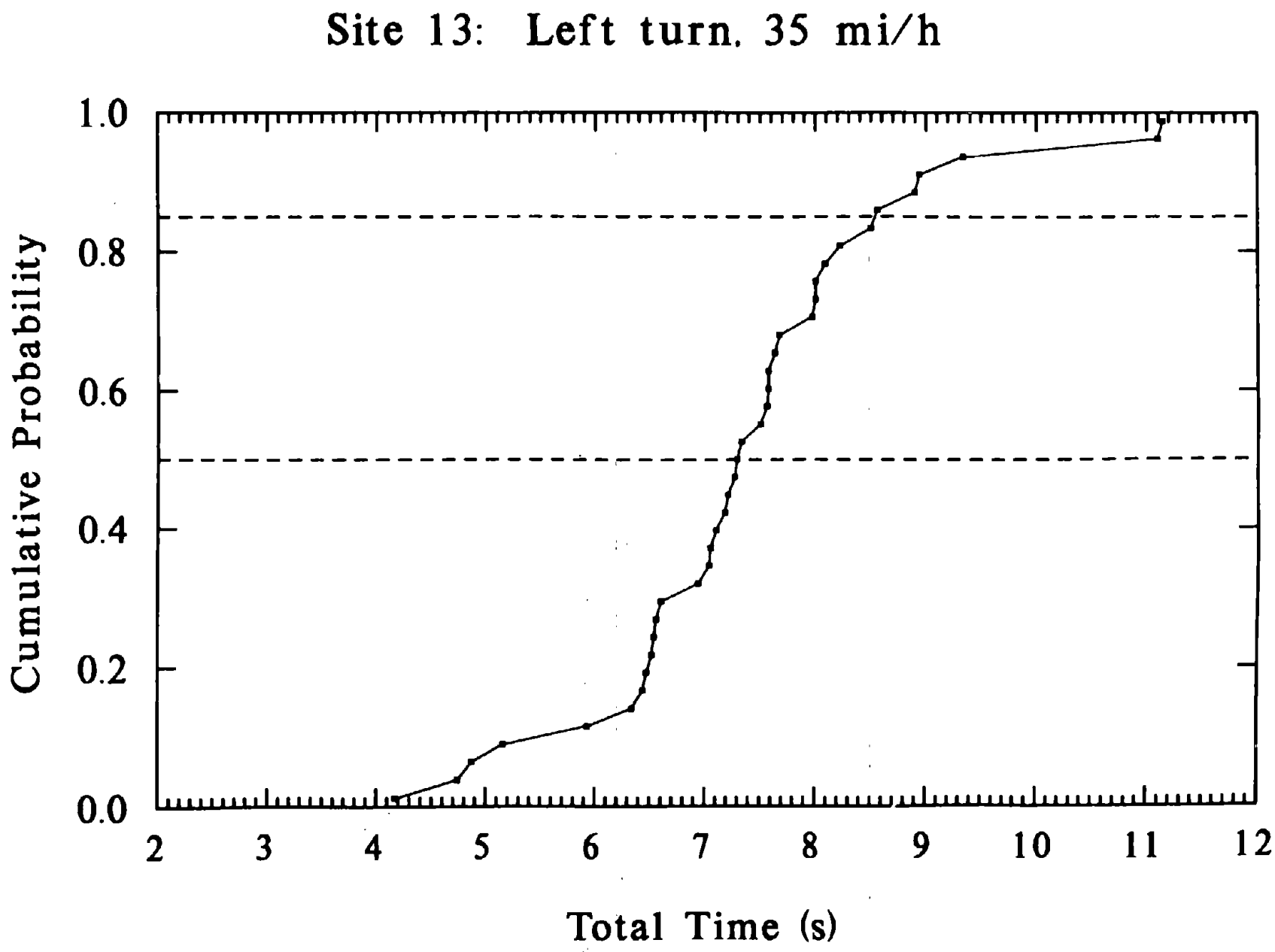


Figure 75. Cumulative frequency plots for site 13: through, divided, 55 mi/h, total time(s).

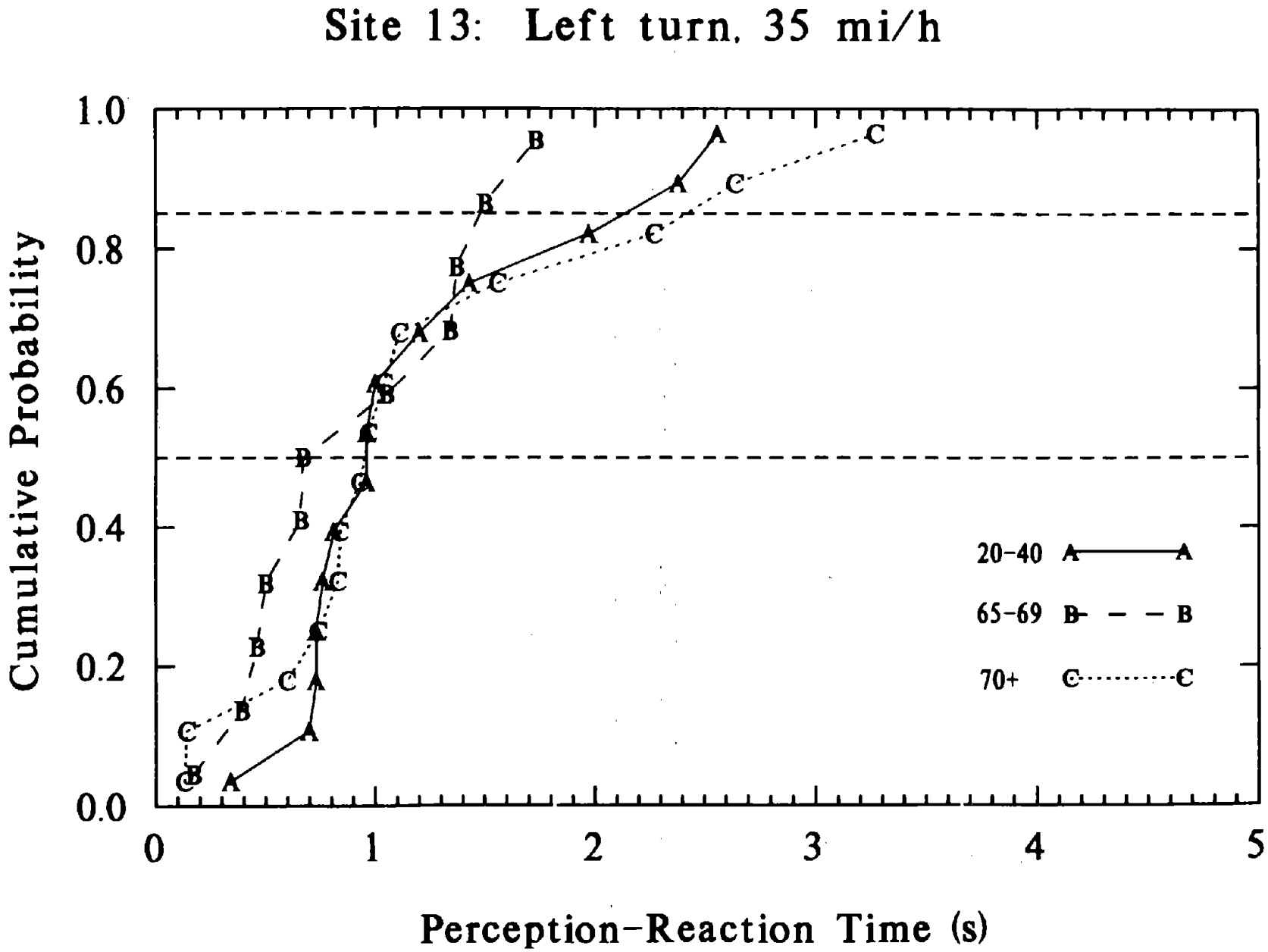


Figure 76. Cumulative frequency plots for site 13: through, divided, 55 mi/h, perception-reaction time(s), by age.

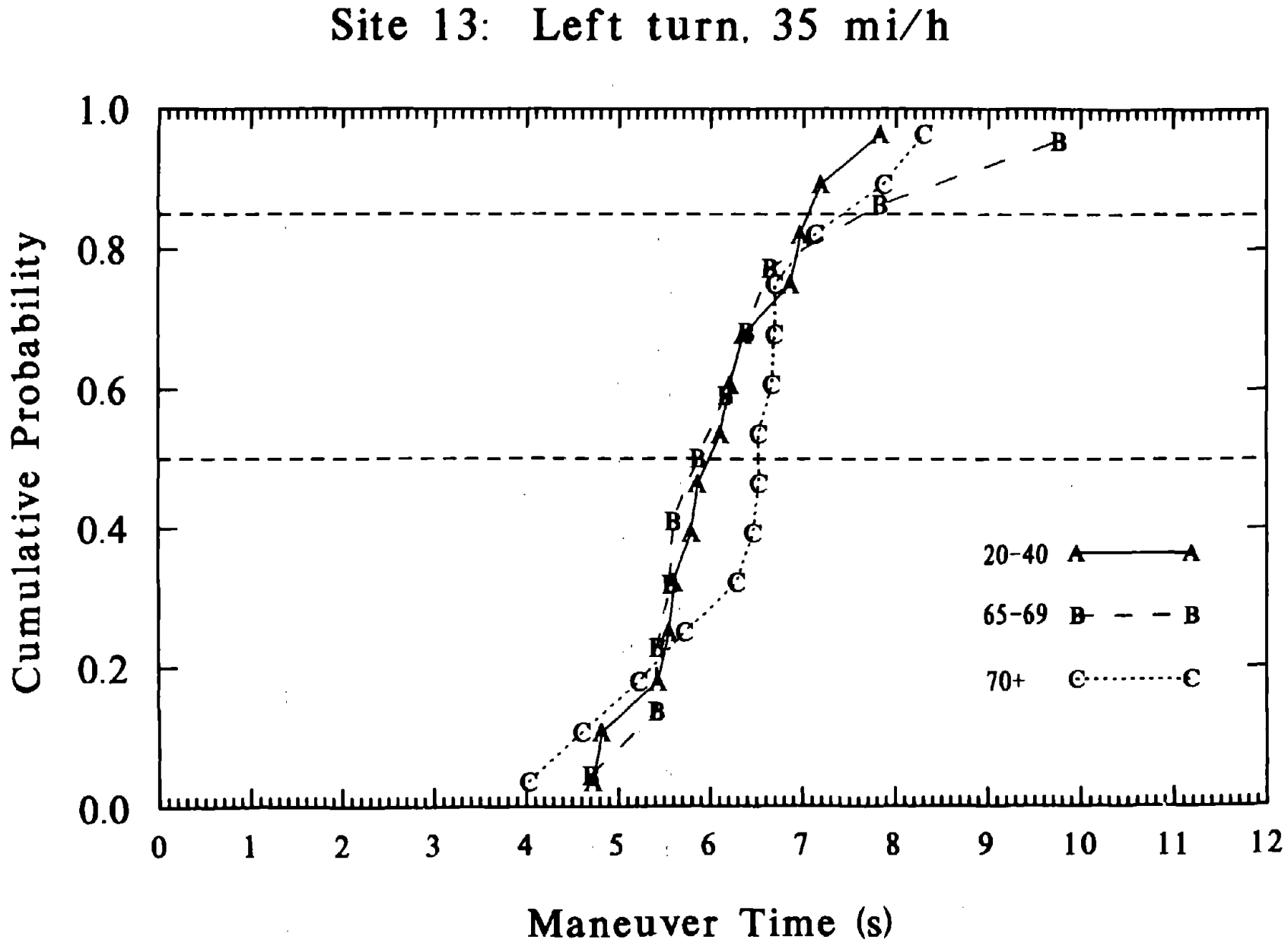


Figure 77. Cumulative frequency plots for site 13: through, divided, 55 mi/h, maneuver time(s), by age.

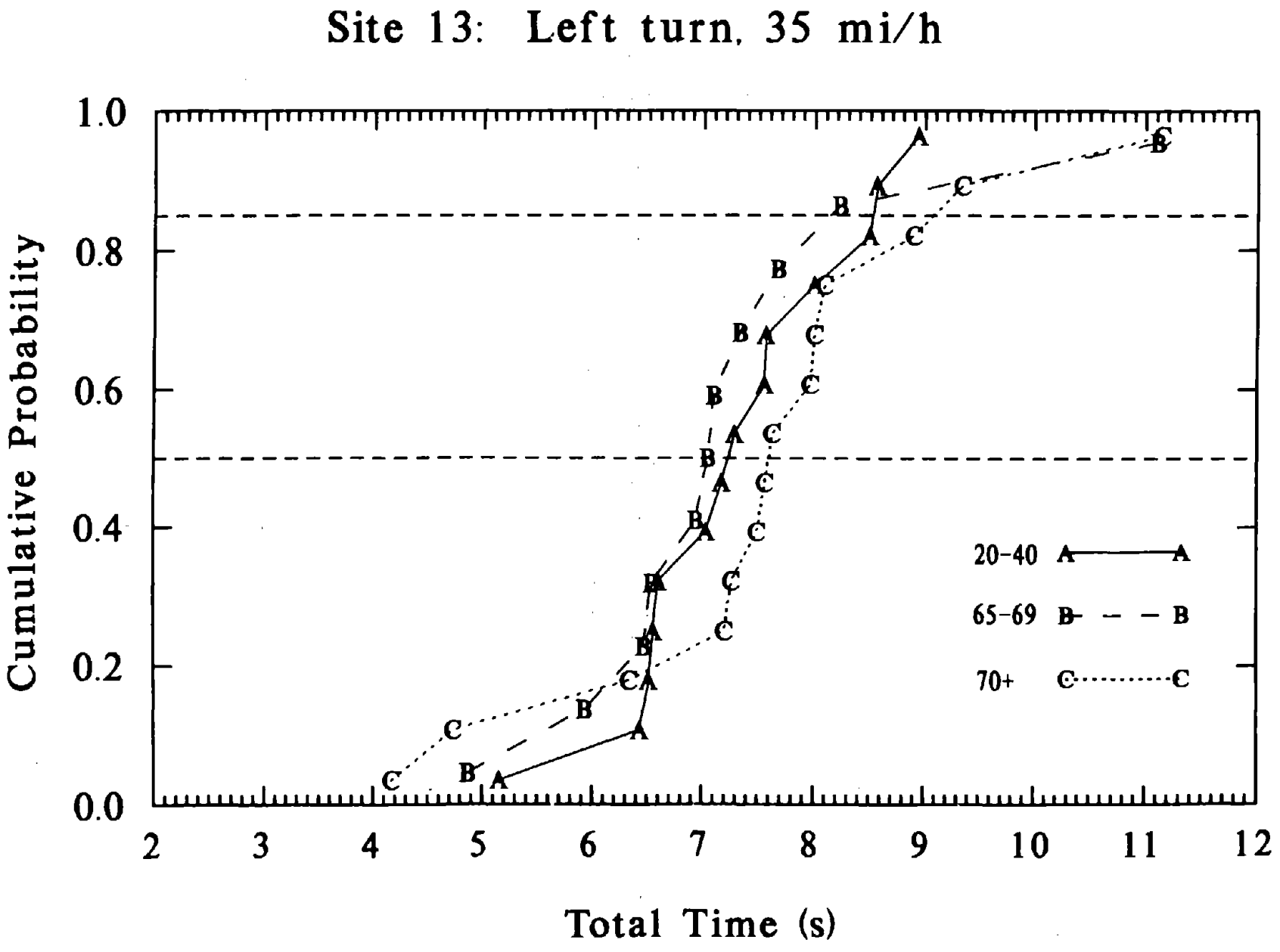


Figure 78. Cumulative frequency plots for site 13: through, divided, 55 mi/h, total time(s), by age.

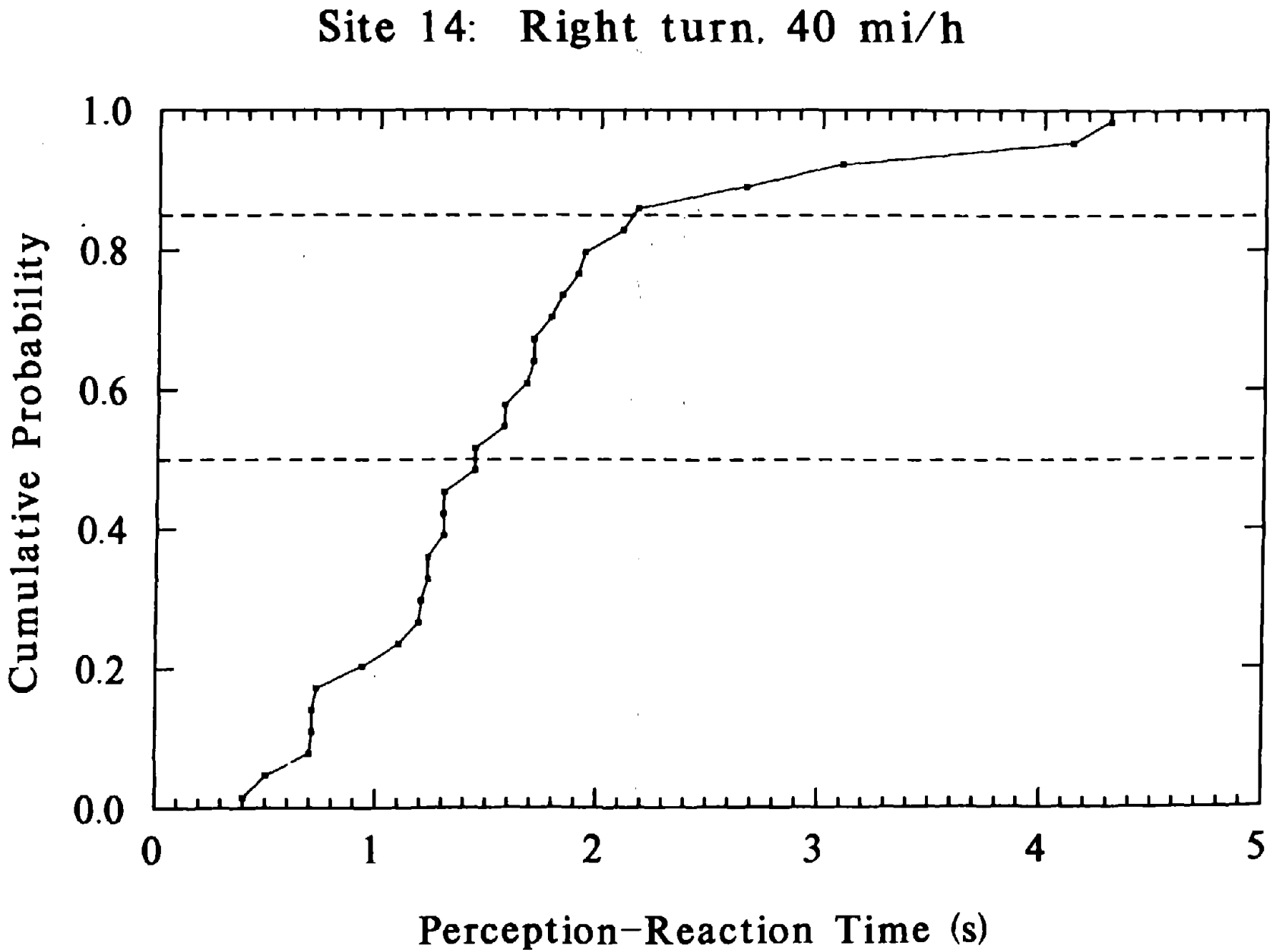


Figure 79. Cumulative frequency plots for site 14: through, divided, 55 mi/h, perception-reaction time(s).

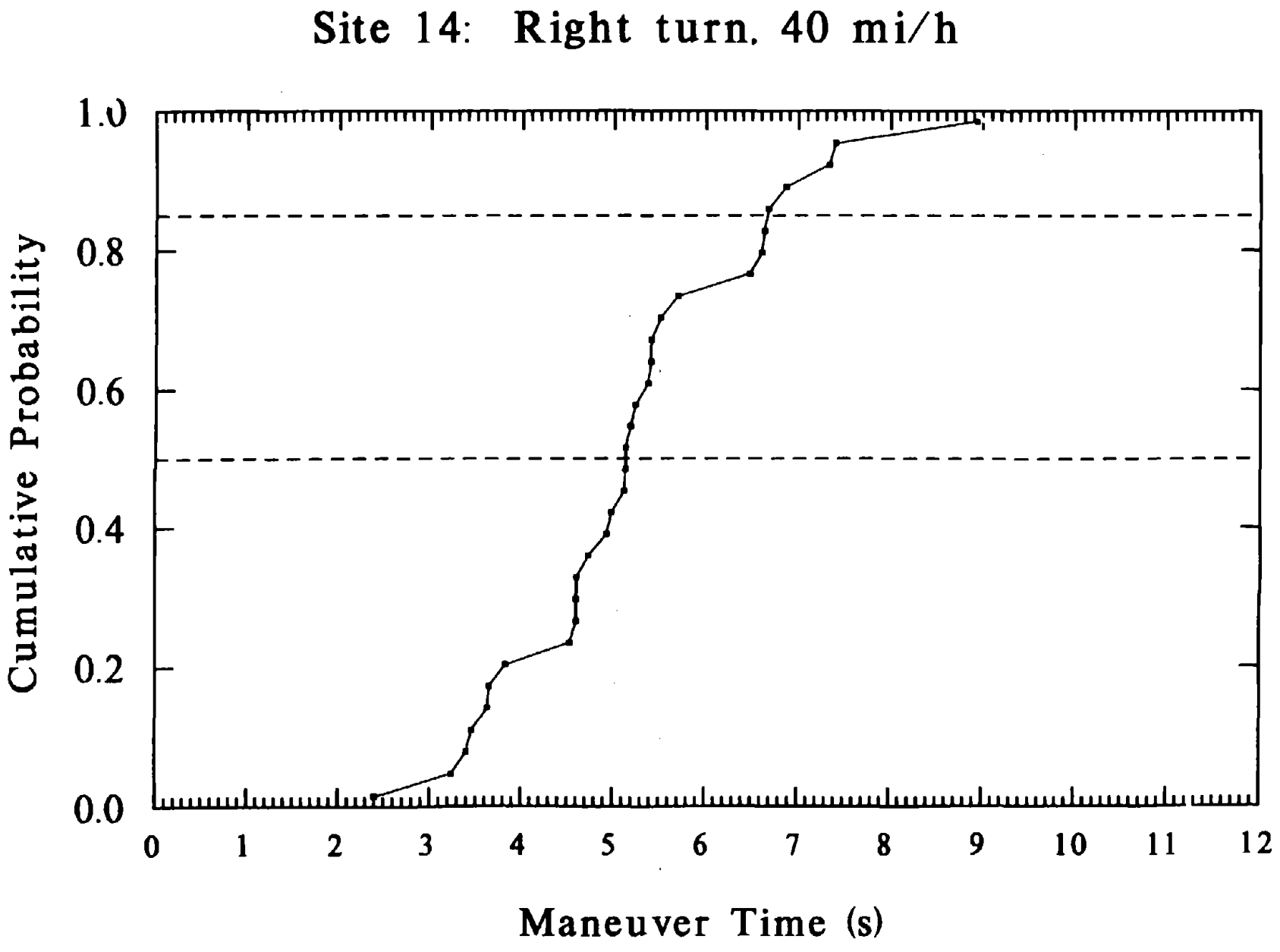


Figure 80. Cumulative frequency plots for site 14: through, divided, 55 mi/h, maneuver time(s).

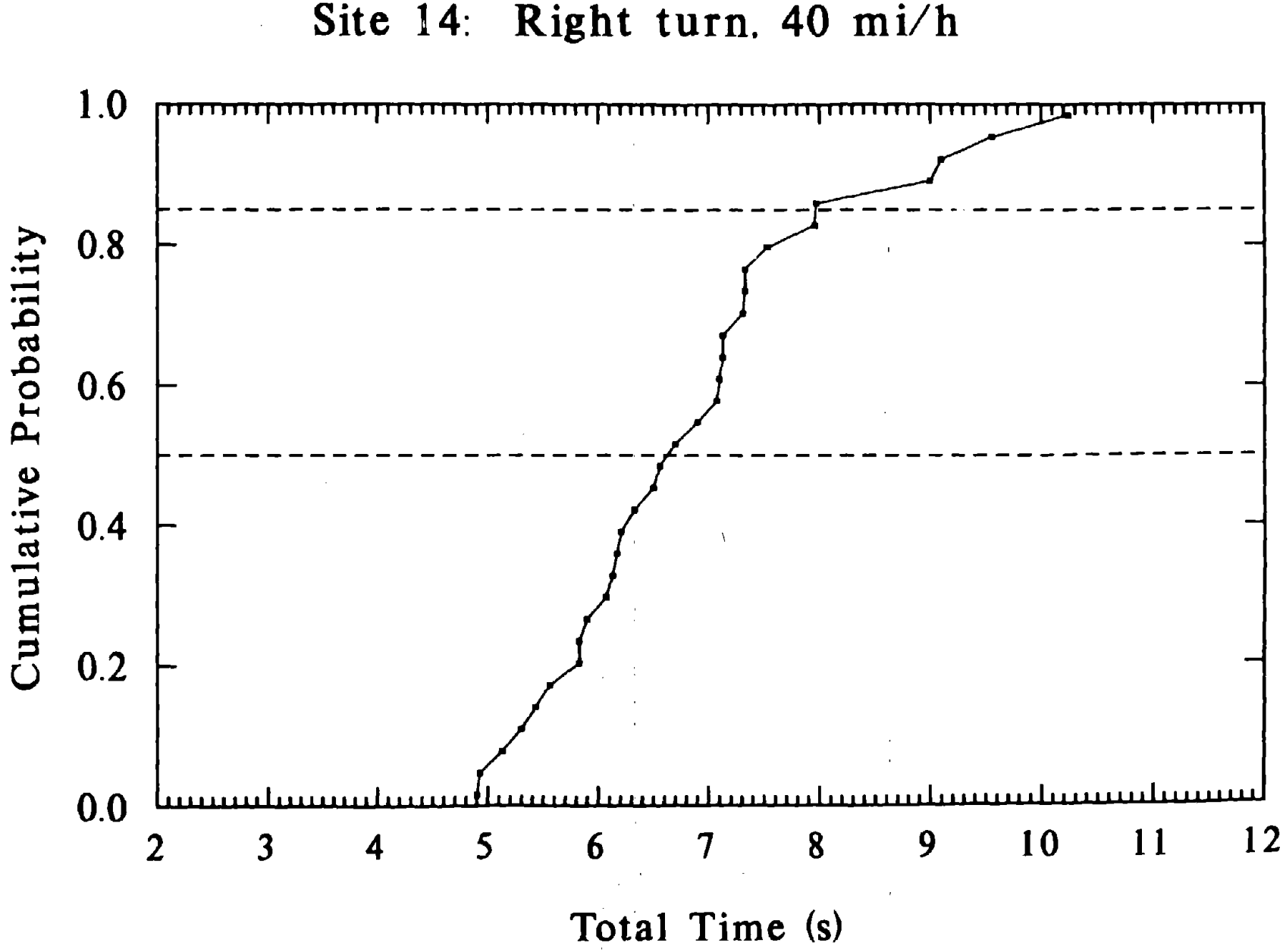


Figure 81. Cumulative frequency plots for site 14: through, divided, 55 mi/h, total time(s).

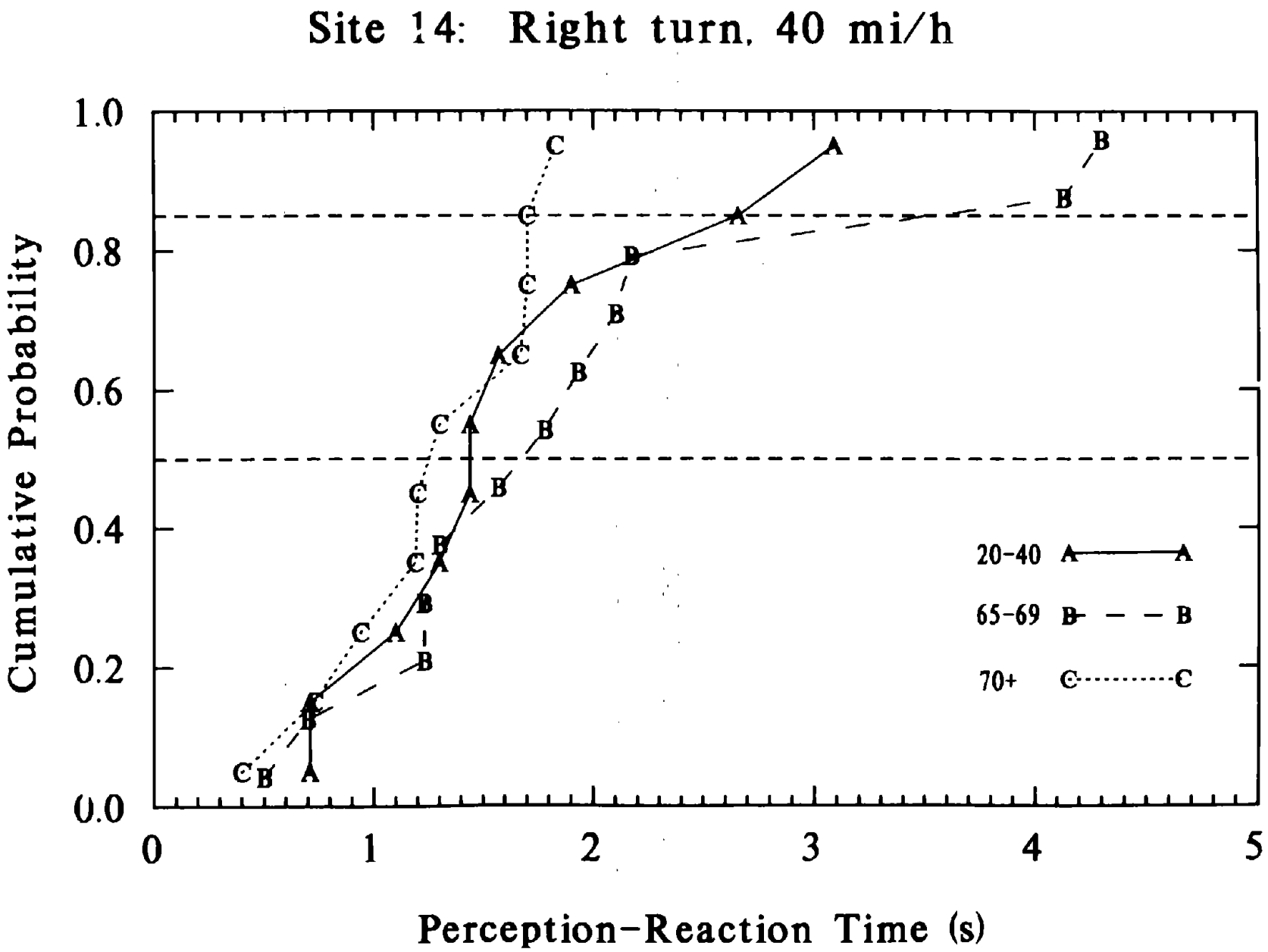


Figure 82. Cumulative frequency plots for site 14: through, divided, 55 mi/h, perception-reaction time(s), by age.

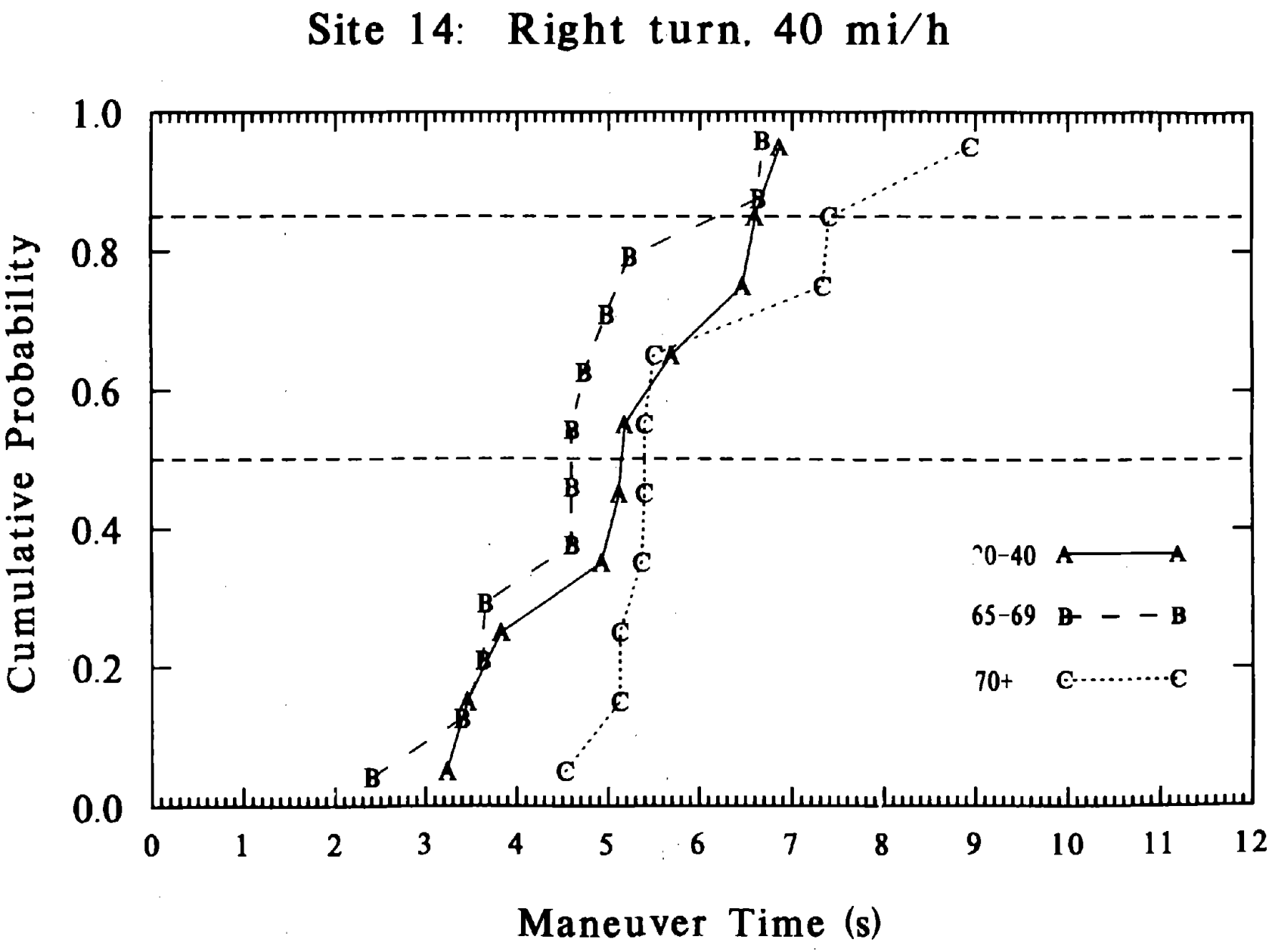


Figure 83. Cumulative frequency plots for site 14: through, divided, 55 mi/h, maneuver time(s), by age.

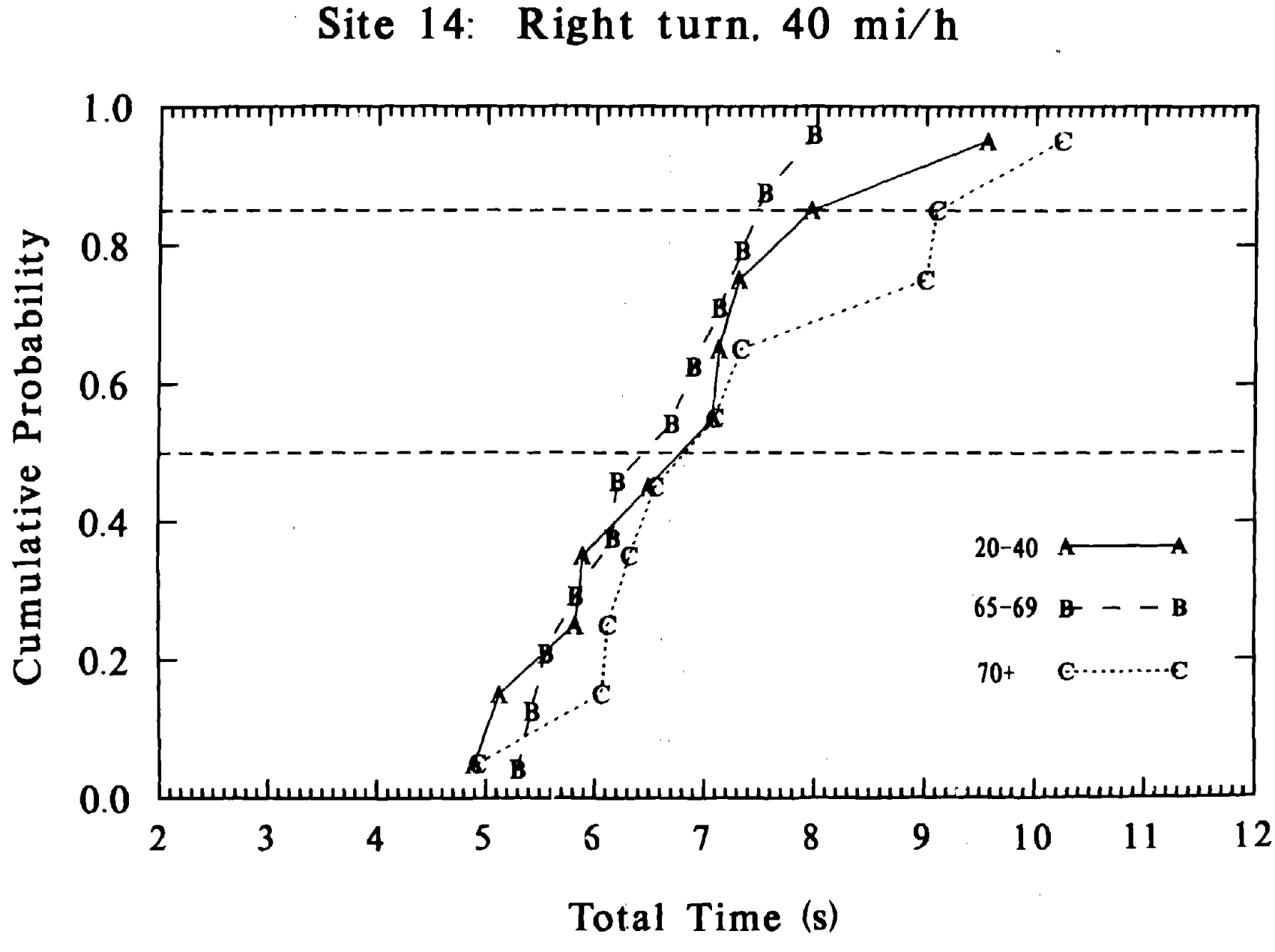


Figure 84. Cumulative frequency plots for site 14: through, divided, 55 mi/h, total time(s), by age.

APPENDIX B. STOPPING SIGHT DISTANCE PRT EXPERIMENT

INSTRUCTIONS TO SUBJECTS

Welcome to the driving study. Before I explain what we'll be doing, I'd like you to read this consent form and sign it as documentation that we explained what the study involves to you. [have subject read and sign consent form]

You are going to be driving your car in your normal manner, and I will be your passenger. I will be telling you where to drive on a short trip over the next few minutes. We are using a new piece of sophisticated measurement equipment today to collect some data during the drive. Let me explain to you how it works and what we will be looking for during the drive.

This system has two components, the sensor that I'm going to attach to your right side window [show them the sensor box], and the control board that I will use as we drive [show control board]. The system is designed to work much like a camera, but it is pointed directly at the ground. As we travel along, the sensor in this box is monitoring things like speed, distance traveled, lane position and the type of pavement. The system is almost completely automatic, but I will be providing a few other inputs along the route.

Now let me explain what you will be doing. You will drive in your normal manner along a route that I will direct you on. Just relax and drive as you usually do. Stay in the right lane unless I tell you otherwise. If there are any turns or lane changes to make, I will give you plenty of warning.

Every so often, I will ask you to make some judgments about the quality of the roads you have driven on. Often, when we come to a stop sign or traffic signal, we will use that as an opportunity for you to give me your feedback. By "road quality" we mean your feelings about the smoothness of the ride, the ease of handling your vehicle, and the general comfort you feel as a driver. I will note your input and feed it into our data base when we return to the office.

Before we start our drive, we want to make one quick safety inspection to make sure that all of your signal and brake lights are working properly. If you could get in your car and turn the lights on as I ask you to, we can verify that they work and then start on the drive. [check turn signals in the front, high and low beam headlights, turn signals on the rear and brake lights] [use a rag to clean light lenses to ensure that they are easily visible]

OK, now I can hook the sensor box onto your passenger side window and we can begin the drive [secure the box using the suction cups and hooks and then roll the window up enough to hold it in place]. [get in the car and instruct the subject to exit the parking lot and head north on Route 1]

[drive around the route and periodically ask the subjects to make subjective statements about the quality of the road as described above until you reach the last signal light before reaching the barrel]

OK, we're going to take a right here and head west on this stub of Route 100. The road is actually closed, but we have permission to use it from the Maryland State Highway Administration. As we head toward the Interstate 95 on-ramp, keep to your left toward those arrow markers. I'd like you to just move over to the left shoulder and drive around the first one to the left. [wait until they get past the road block] OK, now you can speed up like this is a regular roadway. The only thing that I ask is that you keep your speed right around 40 mi/h (65 km/h) and that you stay in the left lane now, so that we don't interfere with the State Troopers that like to use this road as well. [monitor their speed, remind them if necessary and note any variations from the 40 mi/h (65 km/h) recommendation]

[after experiencing the barrel, drive right on by and bring them back to the staging area without stopping] [point out Steve to those who participated in previous studies with him] OK, we can turn around here in the median and head back toward the starting point of our drive while I ask you some questions and explain about the barrel. [administer the barrel questionnaire and stress the importance of secrecy].

[pay them for their efforts and thank them for participating]

[remove equipment from the car and send them on their way]

POST-EXPERIMENT QUESTIONNAIRE

Name: _____ Phone: _____

Address: _____ Session date/time: _____

Transmission: Standard ___ Automatic ___

Vehicle Type: _____ Make/Model/Year: _____

While we drive back to our meeting place, I have a set of questions to ask you.

At the end of the route we drove, a barrel rolled toward the road. This was part of the study. We measure the time it takes people to react to a situation like this. Of course, the barrel is chained so that it never really reaches the road. I have several questions to ask you about this part of the session.

Did you have any prior knowledge that something like this might happen during the drive? (If yes, explain)

Did the barrel surprise you? Did it seem realistic?

Think back to your first reaction to the barrel. What did you do? Do you feel you reacted as quickly as usual? Do you think your actions were typical of how you would react in some emergency situation?

The purpose of seeing how long it takes drivers to respond is so that highway designers can use this information in building safer roads. In order for the findings to be meaningful, it is very important that the people taking part in our study do not expect that they will have to react to something. The barrel must be unanticipated. For that reason, we must ask you not to talk about the study to other people who might take part in the research. When people learn in advance about this event, through word of mouth, their reaction time measures become very different, and the research might reach some wrong conclusions. So please, do not tell others about this part of the study. What about the rest of the drive? Do you feel you were driving in your normal manner? (If no, explain)

We hope to learn a lot from the study about how drivers react to different types of roads and how they drive on them. That is why we drove on so many different types of roads and made a number of different kinds of turns and maneuvers. Now I have a few background questions to ask you about your driving.

Age: _____ Number of years driving: _____

About how many times a week do you usually drive?

____ None	____ 6-9
____ 1-2	____ 10-15
____ 3-5	____ More than 15 trips per week

How often do you drive at night?

Do you have any vision problems? (If yes, explain)

Do you have any other difficulty that interferes with your driving?

Have you restricted the kind of driving you do in any way?

If you have to hit the brakes in an emergency, how do you think your brake reaction time compares to the average driver on the road?

A-Much slower B-Somewhat slower C-Slightly slower D-About same
E-Slightly faster F-Somewhat faster G-Much faster

This study was only one part of a larger project. We will be looking for people to take part in these future driving studies too. Would you be interested in taking part in future research studies?

Yes ____ No ____ Undecided ____

We need quite a few more volunteers. Can you think of anyone else who might want to take part? (record names, phone # if they know it; or have them ask, give flyer)

APPENDIX C. DECISION SIGHT DISTANCE PRT EXPERIMENT

INSTRUCTIONS TO SUBJECTS

Before I explain the procedure we'll be using, let me tell you about our video camera system. To have a visual record of the trip, we are going to videotape the view from the car while you drive. We will do this by having a video camera mounted to a ski rack. The ski rack hooks onto the roof of your car, and will not mar it in any way. The camera will film the road ahead of you as you drive. We will also be using a microphone in the car to record what you say. I will explain why we do this in a minute.

You will drive your car just the way you normally do, with me as your passenger. You will travel over a course that will take about 60 minutes to complete. During the drive, you will encounter some situations where you find you will need to make some driving maneuver. For example, in order to stay on the road you want to travel, you might have to get out of the lane you are in and move to another lane. What we want to find out is exactly when you recognize that you have to make a driving maneuver. As soon as you realize the need to make a maneuver, you will tell us by saying what the necessary maneuver is. Your choices are: "move left," "move right," "go slow," or "stop." It is very important that you tell us what you are going to do as soon as you recognize the need for it. We also need to know what you saw that first let you know that you needed to make a maneuver. After you tell us what maneuver you must make, then also state aloud what cue you saw that prompted your decision. The cue might be the path of the road, or a lane marking, or a sign, or other traffic, anything at all that told you of the need to make a maneuver.

I must emphasize again that you should drive the way you always do, and perform all your driving moves just as usual. The only difference between this session and everyday driving is that you will tell us what your driving maneuvers will be as soon as you see the need for them. We will practice doing this before we start the actual experiment so that you are comfortable with it.

Now let me explain the drive to you. I will direct you on where we are going. Stay in the right lane, unless I tell you otherwise. During the drive, you will sometimes come to a situation where, in order to go where you want to go, you will need to make some driving maneuver. Make any changes in lanes, speed, the road you follow, or whatever you need to do to go where you want to. This is just normal driving. The only difference is that you will also be telling us about the need to make the maneuver as soon as you become aware of it.

Let me just summarize the most important points again:

1. Drive along the route I direct you on, staying to the right lanes unless I tell you otherwise.
2. If you recognize that you have to make some kind of driving maneuver in order to follow the path you want, state that maneuver out loud as soon as you see the need for it. Your choices are to say "move left," "move right," "go slow" or "stop."
3. After you state the maneuver, briefly describe whatever cue first told you of the need to make the maneuver.

We will practice this procedure now. Do you have any questions before we start?

STUDY ROUTE

Study subjects were taken over a 35-mi (56-km) course that ran through Montgomery County, MD and Fairfax County, VA. The study route included sections of Interstate freeways, primary arterials, minor arterials, and secondary roads. A total of 13 study sites was identified on the route:

- 5 freeway lane drops (4 right lane and 1 left lane).
- 1 lane drop due to curb side parking (right lane).
- 5 arterial turn-only lanes (3 right and 2 left).
- 1 freeway left exit.
- 1 complex intersection.

Subjects were instructed to drive in their normal manner, drive at the posted speed limit, obey all traffic laws, and were instructed as to which lane to drive in at each site by the experimenter. While some subjects were familiar with portions of the course, the majority of the drivers were familiar with at most one or two sites and many were not familiar with any of the sites. Those sites that a subject was familiar with were noted by the experimenter.

The following figure identifies the routes and locations of the 13 sites. A description of each site is given below in the order in which they occurred along the route. (Note: Due to construction, some of the sites have been modified since the experiment was conducted in 1991).

Site 1. I-495 NB (Inner Loop) at the American Legion Bridge (Virginia)
Type: Freeway right lane drop

The right-most lane of I-495 NB ended approximately 1/4 mi (2/5 km) south of the American Legion Bridge, reducing the roadway from 4 lanes to 3 lanes and requiring vehicles in the right lane to merge left. Subjects were instructed to drive in the right lane when approaching this lane drop. The cue points were as follows:

1. A warning sign "Right Lane Ends 2000 Ft" on the right side of roadway.
2. A warning sign "This Lane Ends" mounted on an overpass visible approximately 750 ft (229 m) before the lane ended.
3. Geometry - end of painted lane markings.

Site 2. I-495 EB (Inner Loop) at MD 355 Interchange (Maryland)
Type: Freeway right lane drop (right lane exit only)

The right lane of EB I-495 must exit at the MD 355 interchange, reducing the roadway from 3 to 2 lanes and forcing through traffic in the right lane to merge to the left. Subjects were instructed to drive in the right lane when approaching this lane drop. There were four separate cue points:

1. Overhead warning sign "Exit Only 1 Mile" located 1 mi (1.6 km) in advance of the exit.
2. Warning sign "Right Lane Must Turn Right at MD 355" located on the right side of the road approximately 600 ft (183 m) before the exit.
3. Warning sign "Right Lane Must Exit" located on the right side of the road approximately 500 ft (153 m) before the exit.
4. Pavement markings - a right turn arrow and "ONLY" located at the beginning of the exit lane.

Site 3. Cedar Lane WB (Maryland)
Type: Right lane drop due to parking

Cedar Lane is a four-lane road in Bethesda, MD. West of the intersection with MD 355 the roadway is reduced from 4 travel lanes to 2 travel lanes due to the presence of curb side parking. Through traffic in the WB right lane is forced to merge into the left lane. There is only one cue point, which is the point at which the parked cars first become visible. Subjects were instructed to drive in the right lane when approaching this site. During many of the night time runs there were no cars parked, so there are less data for night.

Site 4. MD 187 NB at Democracy Blvd. (Maryland)
Type: Left-lane turn-only

MD 187 is a 6-lane arterial (3 lanes each direction) running between Bethesda and Rockville, MD. At Democracy Blvd., the left through lane of NB MD 187 becomes a left-turn-only lane, forcing through traffic to merge into the right 2 lanes. Subjects were instructed to drive in the left through lane when approaching this intersection. There are four separate cue points:

1. Warning sign "Left Lane Must Turn Left at Democracy Blvd." located on the left side of the roadway approximately 750 ft (229 m) from the intersection. This sign caused confusion for some subjects because the Democracy Blvd. intersection is not visible at this point and the sign gives no indication of its location.
2. Warning sign "Left Lane Must Turn Left" located on the left side of the roadway approximately 400 ft (122 m) from the intersection. This sign also caused some confusion because there are two left turn lanes (a left turn bay and the former left through lane) and many drivers thought that this sign referred to the left turn bay only and not the left travel lane.
3. Pavement markings - Directional arrows and "ONLY" markings on the pavement approximately 400 ft (122 m) from the intersection.
4. A warning sign showing lane usage arrows located on the left side of the roadway approximately 350 ft (107 m) from the intersection.

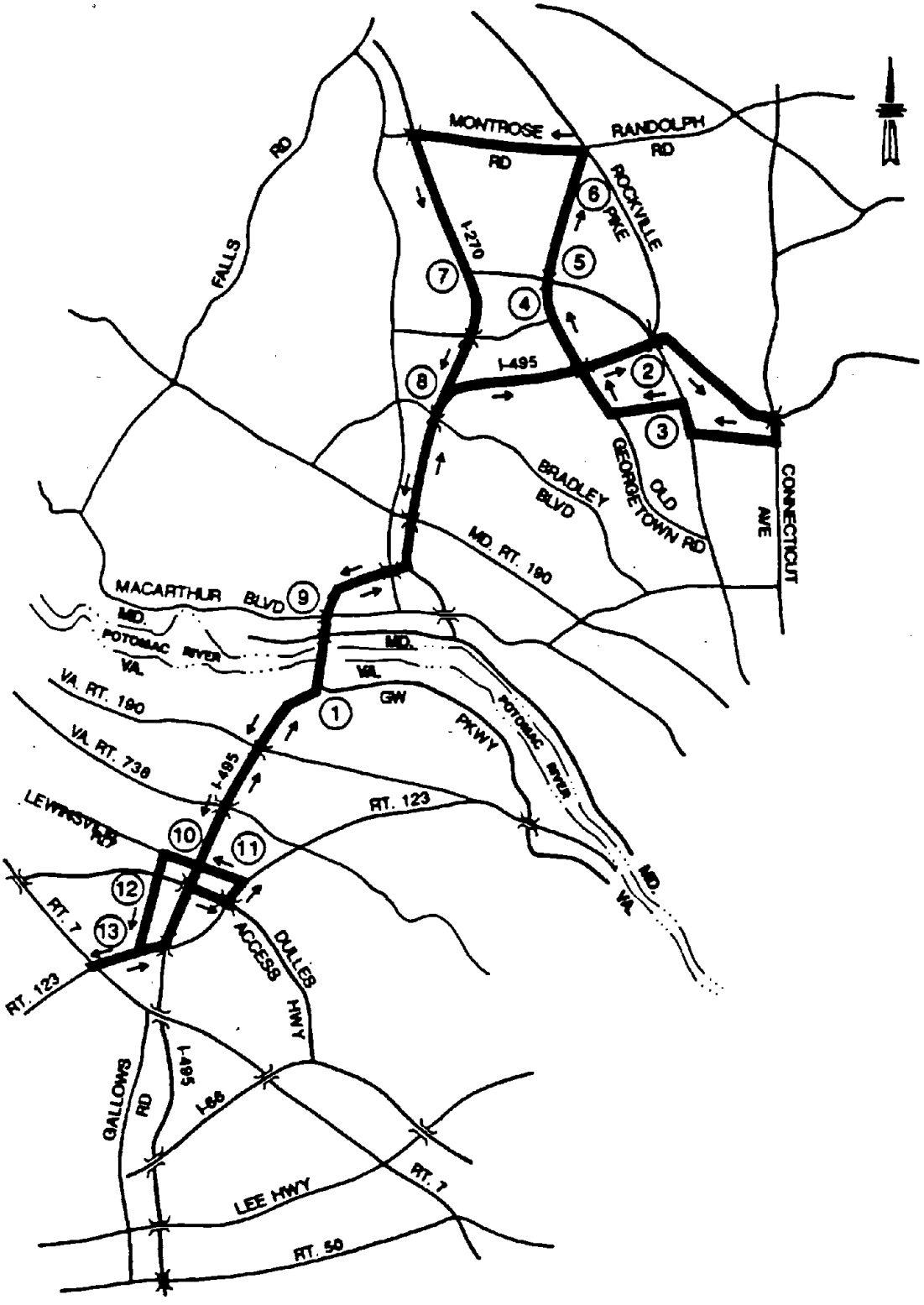


Figure 85. Study route and location of test sites.

Study route and Location of test sites.

Site 5. MD 187 NB at Nicholson Lane (Maryland)
Type: Right lane turn-only

The NB approach of MD 187 is 3 lanes at the intersection with Nicholson Lane. The right lane must turn right onto Nicholson Lane, forcing through traffic to merge left. Subjects were instructed to drive in the right lane when approaching this intersection. There were two cue points:

1. Warning sign "Right Lane Must Turn Right" located on the right side of the roadway approximately 750 ft (229 m) before the intersection.
2. Pavement markings - Directional arrows and "ONLY" markings on the pavement approximately 600 ft (183 m) before the intersection. The pavement markings were visible almost simultaneously with the warning sign when not obstructed by another vehicle.

Site 6. MD 187 NB at MD 355 (Maryland)
Type: Complex intersection

The NB approach of MD 187 is 3 lanes. At the intersection with MD 355 the left and center lanes become exclusive left-turn lanes while the right lane becomes a shared left and through lane. A right-turn-only lane is also added. Subjects were instructed to drive in the center lane when approaching this intersection and were therefore required to shift one lane to the right in order to continue straight through the intersection. There were two cue points:

1. Pavement markings - Directional arrows, "ONLY" markings, and turn lane delineation markings on the pavement approximately 400 ft (122 m) before the intersection.
2. Directional arrow signs located on an overhead span wire next to the signal heads. These signs were only visible fairly close to the intersection and very few subjects reacted to them as cue points.

Site 7. I-270 Spur SB near Democracy Blvd. (Maryland)
Type: Freeway left lane drop

The left lane of the SB I-270 Spur ends just north of the Democracy Blvd. interchange, narrowing the roadway from 3 through lanes to 2 through lanes. Subjects were instructed to drive in the left lane when approaching this site. There were four cue points:

1. A "road narrows" symbol sign located on the left side of the roadway approximately 700 ft (214 m) before the lane ends.
2. A warning sign "Lane Ends Merge Right" located on the left side of the roadway approximately 750 ft (229 m) before the lane ends. This sign is actually located farther in advance of the lane drop than the symbol sign, but is not legible at as great a distance.
3. Pavement markings - Directional arrows on the pavement approximately 600 ft (183 m) before the lane ends.
4. Geometry of lane ending.

Site 8. I-495 SB (Outer Loop) near Bradley Blvd (Maryland)
Type: Freeway right lane drop

The right lane of I-495 SB ends near the Bradley Blvd. overpass, reducing the roadway from 5 lanes to 4 lanes, and forcing vehicles in the right lane to merge left. Drivers were instructed to drive in the right lane when approaching this site. There were three cue points:

1. A "road narrows" symbol sign located on the right side of the roadway approximately 1000 ft (305 m) before the lane ends.
2. Dashed lane markings on the pavement approximately 750 ft (229 m) before the lane ends.
3. Geometry of lane ending.

Site 9. I-495 SB (Outer Loop) at the George Washington Parkway (Virginia)
Type: Freeway right lane drop (right lane exit only)

The right lane of I-495 was required to exit onto the George Washington Memorial Parkway just south of the American Legion Bridge in Virginia, reducing the roadway from 4 to 3 through lanes. Through traffic in the right-most lane was forced to merge left in order to remain on I-495. Subjects were instructed to drive in the right lane when approaching this site. There were four cue points:

1. Overhead warning sign "Exit Only" on the American Legion Bridge approximately 1500 ft (458 m) before the exit. This sign was not properly aligned over the right lane and was found to be confusing to many subjects.
2. Warning sign "Right Lane Must Exit" on right side of the road. This was a temporary construction sign and was very difficult to see, particularly at night. Few subjects responded to this cue point.
3. Warning sign "Right Lane Must Turn Right" on the right side of the road approximately 750 ft (229 m) before the exit.
4. Geometry - Solid lane markings began approximately 500 ft (153 m) before the exit.

Site 10. I-495 SB (Outer Loop) at the I-66 East Interchange (Virginia)
Type: Freeway left exit

The exit ramp from I-495 SB to I-66 East is located on the left side of the roadway. Subjects were instructed to drive in the number 3 lane (third lane from the left) and were told to take I-66 East. There are four overhead warning signs located prior to the exit. All four are variable message signs (dot matrix) which some subjects said they had trouble reading.

This was one of the most commonly missed sites and it yielded inconsistent data. Many subjects were anticipating a right-hand exit and therefore did not read the warning signs which were located on the left side of the road. Another problem was that this exit was in fact not I-66 EB but rather an access road that eventually ties into I-66. The main I-66/I-495

interchange is located several miles further south, and many subjects assumed that it was the main interchange that they were heading for. Many subjects expressed confusion when they saw signs for the access road to I-66 EB. Because of the problems encountered during data collection, it was decided to drop this site from the analysis.

Site 11. Lewinsville Road at Windy Hill Road (Virginia)
Type: Right lane turn-only

The right lane of WB Lewinsville Road must turn right at Windy Hill Road, reducing the roadway from two through lanes to one through lane and forcing through traffic to merge left. Subjects were instructed to drive in the right lane when approaching this intersection. There were four cue points:

1. Warning sign "Through Traffic Use Left Lane" located on the right side of the roadway approximately 750 ft (229 m) before the intersection.
2. Warning sign "Through Traffic Use Left Lane" located on the right side of the roadway approximately 400 ft (122 m) before the intersection.
3. Pavement markings - Directional arrows and "ONLY" markings approximately 250 ft (76 m) before the intersection.
4. Warning sign with directional arrows located on the right side of the road approximately 200 ft (61 m) before the intersection. This sign was often obscured by trees and very few subjects responded to it.

Site 12. International Drive at Tyco Road (Virginia)
Type: Left lane turn-only

The left lane of Spring Hill Road becomes a left-turn-only lane at the intersection with Tyco Road, requiring through traffic to merge right. Subjects were instructed to drive in the left lane when approaching this intersection. There were two cue points:

1. Pavement markings - Directional arrows on the pavement approximately 300 ft (92 m) from the intersection. These pavement markings were faded and many subjects found them difficult to see, particularly at night.
2. Signal heads - Many subjects identified the left-turn signal heads as the cue point that they first recognized.

Site 13. International Drive SB at Westpark Drive (Virginia)
Type: Right lane turn-only

The right lane of International Drive must turn right at Westpark Drive, requiring through traffic to merge into the left two travel lanes. Subjects were instructed to drive in the right lane when approaching this intersection. There was one cue point:

1. A sign with directional arrows located on the right side of the road about

300 ft (92 m) before the intersection. This was the only warning for the right-turn-only lane, and one of the most commonly missed cues.

Many subjects at this site detected the warning sign, but then looked ahead to the intersection for some confirmation that the right lane was a turn-only lane. Because there were no additional signs or pavement markings, many subjects expressed confusion or at least delayed their response. This resulted in inconsistent data and some unrealistically long PRT. It was therefore decided to drop this site from the data analysis.

Daytime runs were conducted between 10:00 AM and 3:00 PM, and night-time runs were generally conducted just after sunset. Because much of the course was on heavily traveled arterials, daytime runs were often considerably slower than the night-time runs.

OTHER OBSERVATIONAL DATA

In addition to the analyses of the PRT and maneuver times, there are other observations made by the experimenter that might provide insight into the driving behavior of elderly drivers. These are presented below:

Driving Observations

All subjects were instructed to drive at the posted speed limit and, for the most part, to drive in the right lane. Maintaining the speed limit was generally not found to be a problem, and the experimenter reminded drivers of the speed limit whenever they deviated from it significantly.

Somewhat surprisingly, many older drivers stated that they did not normally like to drive in the right lane because of the presence of trucks and merging traffic. Another problem encountered was that two of the test sites (nos. one and nine) were located in construction zones, and many drivers felt uncomfortable driving in the right lane when concrete jersey barriers were present. This led to several premature lane changes.

Some site-specific observations are listed below. For the sites not listed, there were no unusual observations.

Site 2: **I-495 at MD 355 (Right Lane Drop)**
Those subjects responding to the first cue point, the overhead warning sign "Exit Only 1 Mile," were generally more relaxed about making their maneuver since they knew they had 1 mi (1.6 km) to do it. Those responding to later cue points, particularly the lane markings, generally displayed more urgency in making their maneuver because they realized that they had little time to do it. While a large proportion of younger drivers responded to the first cue point, a greater proportion of older drivers responded to later cue points. This may explain why maneuver

times at this site are shown to be slightly longer for younger subjects than for older subjects.

Site 4: **West Cedar Lane (Right Lane Drop)**
The right lane was consistently blocked by parking during the daytime tests. Parking during the evening hours was more sporadic, particularly during the summer months when night-time tests were conducted late in the evening. Consequently, some data from the night-time runs at this site was considered invalid.

Site 6: **MD 187 at MD 355 (Complex Intersection)**
Nearly all subjects reported that they were somewhat surprised that the first indications of the triple left-turn configuration at this intersection were the pavement markings delineating the turn lanes. Most said that they would have expected some warning signs in advance of the intersection indicating which lanes turned left and felt that there was not sufficient warning to make the necessary maneuvers safely when in heavy traffic.

Site 8: **I-495 near Bradley Blvd. (Right Lane Drop)**
The only warning sign for this lane drop is small and somewhat difficult to see. Subjects who missed this sign often did not notice the dashed lane markings which indicated that the lane was ending. Other drivers seemed to be unaware of what the dashed lane markings meant and recognized the lane drop only when the lane merged to the left.

Site 10: **I-495 at I-66 (Left Exit)**
This was one of the most commonly missed sites, particularly among the 70+ group. Most drivers who missed this site were expecting a right-hand exit when told they would be taking I-66 East and did not read the signs for the I-66 exit, which were located on the left side of the roadway. Many older drivers also experienced difficulty in locating the exit ramp during night-time runs because it was poorly lit.

Site 13: **International Dr. at Westpark Dr. (Right Turn Only)**
This was the second most commonly missed site. The only cue point at this sight was a single warning sign. Many drivers indicated that they noticed the warning sign, but were expecting some sort of confirmation of the right-turn-only lane at the intersection itself (e.g., pavement markings or additional signing). When they failed to notice any other signs or markings, many drivers either expressed confusion or ignored the initial warning sign.

General Observations

The following are general observations made by the experimenter during the testing:

- Although subjects were instructed to drive in their normal manner, many subjects felt that they were "probably more alert" than they normally would have been because of the test environment.

- Many of the older participants felt that their perception and reaction abilities had slowed somewhat with age and stated that they compensated for it by driving more cautiously. In fact, older drivers seemed to take fewer driving risks than the younger drivers. Few older subjects drove in excess of the speed limit (some tended to drive 5 to 10 mi/h [8 to 16 km/h] under the limit), most left generous following distances between themselves and the vehicle ahead, and older drivers rarely attempted to cross an intersection during a yellow phase.

- It seemed that older drivers were often less likely to notice roadside signs and more likely to respond to pavement markings than their younger counterparts. (This is discussed in chapter 3 of Volume I).

- Almost all older drivers felt that they do not see as well at night.

- The rate at which subjects made observations of their environment seemed to be slower for some of the older subjects than for the younger subjects. While this observation rate may have been several times per second for younger drivers, it seemed to be only once every few seconds for some older drivers. It was not uncommon to have an older driver stop at a green light, because the last time he/she had noticed -- several seconds before -- it had been red. Similarly, older drivers often took longer to notice signal changes when stopped at a traffic light.

- Many older drivers felt that traffic signs, and street signs in particular, need to be made larger and easier to read.

ADDITIONAL DATA ANALYSIS

The following are additional tables, charts, and data summaries not included in the main body of the report.

Statistics for PRT Values by Age, Situation, and Day/Night Condition.

Day Time		Decision Sight Distance Situation (Site Number)												
		1	2	3	4	5	6	7	8	9	10	11	12	13
Age 70+	Number (n)	14	21	21	18	20	17	18	14	15	9	18	14	10
	Maximum	11.97	16.50	7.83	10.70	12.03	8.97	5.47	9.57	10.87	14.10	11.70	9.77	15.97
	Minimum	2.43	0.97	1.50	1.17	0.73	1.63	0.83	2.27	1.40	1.50	1.17	4.07	7.17
	Mean	5.72	5.41	3.57	4.42	2.88	3.71	3.02	4.51	6.31	6.28	4.78	6.99	11.30
	Std Deviation	2.77	3.94	1.79	2.85	2.30	1.70	1.37	1.87	2.57	3.95	2.80	2.08	2.41
	Variance	7.66	15.49	3.19	8.12	5.28	2.90	1.88	3.49	6.59	15.58	8.36	4.31	5.80
Age 65-69	Number (n)	15	13	15	14	16	13	12	11	8	11	13	14	9
	Maximum	7.50	9.23	3.53	20.23	5.37	8.20	7.10	9.80	16.37	9.60	9.27	12.83	14.33
	Minimum	0.63	1.60	1.63	1.27	0.73	0.80	0.67	0.13	0.17	1.00	0.43	1.13	0.30
	Mean	4.27	4.35	2.46	6.01	2.53	2.51	3.12	6.64	6.28	4.95	3.38	6.27	7.98
	Std Deviation	1.78	2.22	0.46	5.43	1.36	1.90	1.68	2.90	4.58	3.19	2.37	3.27	4.68
	Variance	3.18	4.93	0.21	29.51	1.84	3.62	2.81	8.38	21.01	10.15	5.64	10.66	21.93
Age 20-40	Number (n)	10	12	13	12	14	13	12	11	6	10	13	11	7
	Maximum	7.07	12.37	6.13	5.17	3.30	9.70	6.13	7.97	8.73	9.07	4.63	4.93	10.37
	Minimum	1.40	1.17	1.20	1.27	0.70	0.57	0.60	0.17	0.27	1.17	0.37	0.57	3.53
	Mean	4.05	6.56	2.76	2.68	1.60	2.83	2.16	2.88	4.30	4.36	2.05	2.52	7.02
	Std Deviation	1.72	3.15	1.48	1.04	0.69	2.46	1.41	2.56	3.14	2.81	1.13	1.48	2.90
	Variance	2.97	9.92	2.19	1.08	0.48	6.06	1.98	6.56	9.85	7.91	1.27	2.20	8.43
Night Time														
Age 70+	Number (n)	8	11	4	9	12	13	11	10	4	7	11	12	5
	Maximum	8.20	7.50	5.37	12.97	6.07	9.40	6.33	13.37	7.80	10.63	7.63	4.97	12.87
	Minimum	4.30	1.90	2.03	0.73	1.23	2.13	1.03	2.10	1.50	5.07	0.77	1.27	10.50
	Mean	5.97	4.26	3.79	3.90	2.98	4.83	2.49	5.35	4.39	7.55	2.84	2.59	11.30
	Std Deviation	1.35	1.70	1.23	3.71	1.62	2.18	1.36	3.20	2.49	1.64	1.86	1.20	0.90
	Variance	1.82	2.90	1.50	13.74	2.64	4.77	1.84	10.25	6.21	2.68	3.48	1.43	0.82
Age 65-69	Number (n)	13	12	4	13	15	13	9	9	9	7	15	15	11
	Maximum	6.57	10.37	5.80	6.93	4.43	6.03	5.27	7.47	12.77	8.73	8.13	6.80	15.20
	Minimum	1.27	1.47	2.07	1.33	1.43	0.83	1.20	2.43	0.80	3.63	0.70	0.97	6.07
	Mean	4.21	5.02	3.74	3.57	2.39	3.10	2.80	4.90	4.85	6.71	3.54	2.20	10.62
	Std Deviation	1.48	2.84	1.60	1.76	0.92	1.45	1.22	1.73	3.41	1.58	2.00	1.38	3.37
	Variance	2.20	8.05	2.56	3.11	0.84	2.11	1.48	2.99	11.62	2.48	4.02	1.91	11.38
Age 20-40	Number (n)	11	12	4	13	14	14	11	12	10	7	13	12	9
	Maximum	8.67	10.27	4.37	9.40	4.57	5.07	5.40	9.73	8.20	7.37	5.90	8.93	15.63
	Minimum	1.07	1.20	1.30	1.20	0.90	0.53	0.70	0.77	1.00	1.07	0.20	0.87	6.53
	Mean	3.73	4.44	3.28	4.29	2.41	2.56	3.07	5.63	3.80	3.46	3.63	2.75	9.87
	Std Deviation	2.04	2.70	1.17	2.32	0.99	1.39	1.62	2.49	2.21	2.20	1.79	2.06	2.75
	Variance	4.18	7.30	1.37	5.37	0.99	1.94	2.61	6.21	4.88	4.84	3.21	4.25	7.54

Statistics for Maneuver Times by Age, Situation, and Day/Night Condition.

Day Time		Decision Sight Distance Situation (Site Number)												
		1	2	3	4	5	6	7	8	9	10	11	12	13
Age 70+	Number (n)	14	21	21	15	18	17	18	13	13	7	18	14	4
	Maximum	23.83	16.80	8.40	18.93	13.73	15.40	12.27	16.07	25.50	12.17	10.93	11.33	13.70
	Minimum	4.37	3.47	2.47	6.70	3.47	4.10	4.53	1.87	4.70	3.50	2.87	4.03	4.37
	Mean	8.82	7.12	5.79	11.41	7.13	8.09	8.25	5.82	10.20	7.24	5.95	7.45	7.24
	Std Deviation	6.19	2.87	1.38	3.71	2.68	3.12	2.35	3.97	6.74	2.67	2.13	2.08	3.76
	Variance	38.35	8.23	1.91	13.79	7.20	9.73	5.51	15.77	45.43	7.12	4.53	4.31	14.12
Age 65-69	Number (n)	14	11	15	13	15	13	12	12	9	10	13	11	5
	Maximum	15.83	13.13	8.13	19.50	22.20	8.67	11.53	35.40	19.90	28.73	9.17	21.73	9.37
	Minimum	2.43	4.77	3.30	5.50	3.23	3.33	3.63	1.27	2.80	4.53	3.27	3.60	2.93
	Mean	8.14	8.45	5.27	11.63	6.57	5.59	7.07	9.16	9.56	15.00	6.12	7.80	7.06
	Std Deviation	4.17	2.32	1.45	4.41	4.33	1.54	2.56	8.96	6.53	8.03	1.98	4.79	2.28
	Variance	17.35	5.36	2.10	19.42	18.77	2.38	6.57	80.37	42.69	64.43	3.91	22.91	5.22
Age 20-40	Number (n)	10	10	13	12	14	10	12	11	5	10	13	12	6
	Maximum	13.23	12.47	7.07	22.03	13.30	10.43	15.30	7.73	14.60	31.10	14.10	19.13	10.47
	Minimum	3.30	3.77	2.67	4.37	3.83	2.17	3.30	1.07	5.80	2.90	3.63	3.53	5.03
	Mean	6.31	7.63	4.83	11.22	6.14	6.30	6.75	5.26	9.43	10.52	8.38	8.29	7.28
	Std Deviation	2.58	3.07	1.31	5.46	2.35	2.51	3.35	1.82	3.24	9.89	3.31	4.34	2.12
	Variance	6.68	9.43	1.71	29.84	5.54	6.28	11.22	3.31	10.52	97.81	10.93	18.80	4.49
Night Time														
Age 70+	Number (n)	8	8	4	7	11	12	11	10	4	7	11	11	4
	Maximum	16.90	10.67	4.83	28.63	12.87	15.07	10.90	17.83	14.83	36.63	18.23	11.93	8.40
	Minimum	4.80	3.37	2.93	4.17	4.93	4.23	3.33	2.17	5.13	3.97	3.40	3.07	4.10
	Mean	8.76	6.34	3.87	12.81	7.55	7.85	6.38	6.75	8.42	15.06	7.92	6.44	5.88
	Std Deviation	3.95	2.38	0.68	7.65	2.25	3.24	2.07	5.29	3.77	9.83	3.90	2.31	1.75
	Variance	15.62	5.69	0.47	58.59	5.05	10.49	4.28	27.98	14.24	96.58	15.25	5.33	3.06
Age 65-69	Number (n)	13	8	4	12	15	12	9	9	10	6	15	15	9
	Maximum	12.27	11.90	4.60	22.60	10.27	10.57	12.17	12.60	20.13	18.53	10.63	9.27	8.37
	Minimum	4.37	4.57	1.40	2.40	3.80	2.70	4.60	1.23	3.33	4.43	2.47	2.63	4.57
	Mean	6.78	8.21	3.04	11.06	6.22	6.84	7.71	5.37	9.76	11.61	5.85	6.14	7.02
	Std Deviation	2.16	2.54	1.45	5.00	1.78	2.26	2.72	3.14	5.20	5.04	2.36	1.98	1.20
	Variance	4.66	6.43	2.11	24.99	3.16	5.12	7.39	9.84	27.00	25.36	5.55	3.93	1.45
Age 20-40	Number (n)	11	10	4	12	13	13	11	12	10	5	12	11	7
	Maximum	23.80	16.90	3.93	20.80	9.00	10.43	10.73	12.83	23.40	16.13	15.30	10.40	6.87
	Minimum	2.93	2.53	1.70	4.47	2.70	2.73	3.43	2.03	2.70	1.77	2.67	3.07	3.80
	Mean	7.63	8.91	2.88	11.31	5.75	6.28	6.23	5.76	8.64	8.33	7.19	5.54	5.32
	Std Deviation	5.46	4.10	0.83	4.44	2.10	2.14	2.01	2.59	5.55	4.73	3.41	2.02	0.92
	Variance	29.77	16.79	0.69	19.72	4.39	4.60	4.05	6.70	30.80	22.35	11.60	4.08	0.85

Hypothesis Testing on Mean PRTs by Age, Situation, and Day/Night Condition.

	Site No.	Old-Old vs. Young			Young-Old vs. Young			Old-Old vs. Young-Old		
		df	t-Statistic	Statistically Significant 1_/	df	t-Statistic	Statistically Significant	df	t-Statistic	Statistically Significant
Day	1	22	1.68	NO	23	0.31	NO	27	1.69	NO
Time	2	31	-0.86	NO	23	-2.04	NO	32	0.89	NO
	3	32	1.36	NO	26	-0.76	NO	34	2.34	YES
	4	28	2.02	NO	24	2.09	YES	30	-1.07	NO
	5	32	2.01	NO	28	2.31	YES	34	0.54	NO
	6	28	1.15	NO	24	-0.38	NO	28	1.82	NO
	7	28	1.65	NO	22	1.51	NO	28	-0.18	NO
	8	23	1.85	NO	20	3.22	YES	23	-2.22	YES
	9	19	1.53	NO	12	0.91	NO	21	0.02	NO
	10	17	1.23	NO	19	0.45	NO	18	0.84	NO
	11	29	3.21	YES	24	1.82	NO	29	1.43	NO
	12	23	6.01	YES	23	3.52	YES	26	0.69	NO
	13	15	3.32	YES	14	0.48	NO	17	1.97	NO
Night	1	17	2.69	YES	22	0.66	NO	19	2.73	YES
Time	2	21	-0.19	NO	22	0.52	NO	21	-0.78	NO
	3	6	0.61	NO	6	0.47	NO	6	0.05	NO
	4	20	-0.30	NO	24	-0.90	NO	20	0.29	NO
	5	24	1.09	NO	27	-0.07	NO	25	1.20	NO
	6	25	3.24	YES	25	0.98	NO	24	2.38	YES
	7	20	-0.92	NO	18	-0.42	NO	18	-0.53	NO
	8	20	-0.23	NO	19	-0.75	NO	17	0.37	NO
	9	12	0.44	NO	17	0.80	NO	11	-0.24	NO
	10	12	3.95	YES	12	3.17	YES	12	0.98	NO
	11	22	-1.05	NO	26	-0.12	NO	24	-0.91	NO
	12	22	-0.24	NO	25	-0.83	NO	25	0.77	NO
	13	12	1.11	NO	18	0.54	NO	14	0.44	NO

1_/ The differences in PRTs are statistically significant at 95 percent confidence level.

Hypothesis Testing on Mean Maneuver Times by Age, Situation, and Day/Night Condition.

	Site No.	Old-Old vs. Young			Young-Old vs. Young			Old-Old vs. Young-Old		
		df	t-Statistic	Statistically Significant 1_/	df	t-Statistic	Statistically Significant	df	t-Statistic	Statistically Significant
Day	1	22	1.20	NO	22	1.22	NO	26	0.34	NO
Time	2	29	-0.46	NO	19	0.69	NO	30	-1.33	NO
	3	32	2.00	NO	26	0.85	NO	34	1.07	NO
	4	25	0.11	NO	23	0.21	NO	26	-0.15	NO
	5	30	1.10	NO	27	0.33	NO	31	0.45	NO
	6	25	1.54	NO	21	-0.84	NO	28	2.65	YES
	7	28	1.44	NO	22	0.26	NO	28	1.30	NO
	8	22	0.43	NO	21	1.41	NO	23	-1.22	NO
	9	16	0.24	NO	12	0.04	NO	20	0.22	NO
	10	15	-0.85	NO	18	1.11	NO	15	-2.44	YES
	11	29	-2.49	YES	24	-2.11	YES	29	-0.23	NO
	12	24	-0.65	NO	21	-0.26	NO	23	-0.24	NO
	13	8	-0.02	NO	9	-0.16	NO	7	0.09	NO
Night	1	17	0.50	NO	22	-0.52	NO	19	1.50	NO
Time	2	16	-1.57	NO	16	-0.42	NO	14	-1.52	NO
	3	6	1.84	NO	6	0.20	NO	6	1.03	NO
	4	17	0.55	NO	22	-0.13	NO	17	0.61	NO
	5	22	2.04	NO	26	0.64	NO	24	1.69	NO
	6	23	1.44	NO	23	0.63	NO	22	0.88	NO
	7	20	0.18	NO	18	1.40	NO	18	-1.24	NO
	8	20	0.58	NO	19	-0.31	NO	17	0.68	NO
	9	12	-0.07	NO	18	0.47	NO	12	-0.46	NO
	10	10	1.41	NO	9	1.11	NO	11	0.77	NO
	11	21	0.48	NO	25	-1.21	NO	24	1.68	NO
	12	20	0.98	NO	24	0.75	NO	24	0.37	NO
	13	9	0.71	NO	14	3.09	YES	11	-1.39	NO

1_/ The differences in maneuver times are statistically significant at 95 percent confidence level.

Perception-reaction times by gender

Day Time		Freeway		Arterial		All	
		M	F	M	F	M	F
Age 70+	Number (n)	49	33	60	48	109	81
	Maximum	16.50	14.13	12.03	11.70	16.50	14.13
	Minimum	0.83	1.03	0.77	0.73	0.77	0.73
	Mean	4.96	4.93	4.35	4.12	4.63	4.45
	Std Deviation	2.89	3.09	2.73	2.48	2.82	2.77
	Variance	8.36	9.55	7.43	6.13	7.94	7.68
Age 65-69	Number (n)	27	32	35	50	62	82
	Maximum	16.37	9.37	20.23	14.10	20.23	14.10
	Minimum	0.13	0.17	0.73	0.43	0.13	0.17
	Mean	4.85	4.70	4.69	3.24	4.76	3.81
	Std Deviation	3.43	2.40	4.13	2.47	3.84	2.55
	Variance	11.75	5.74	17.06	6.12	14.75	6.48
Age 20-40	Number (n)	26	25	39	37	65	62
	Maximum	12.37	8.73	6.13	9.70	12.37	9.70
	Minimum	0.27	0.17	0.57	0.37	0.27	0.17
	Mean	4.16	3.78	2.18	2.62	2.97	3.09
	Std Deviation	3.05	2.78	1.32	1.74	2.39	2.29
	Variance	9.33	7.71	1.74	3.02	5.71	5.23
Night Time							
Age 70+	Number (n)	33	11	48	13	81	24
	Maximum	7.80	13.37	9.40	12.97	9.40	13.37
	Minimum	1.03	1.63	0.73	0.77	0.73	0.77
	Mean	4.13	5.15	3.23	4.30	3.60	4.69
	Std Deviation	1.98	3.37	2.02	2.95	2.05	3.18
	Variance	3.92	11.39	4.10	8.69	4.22	10.11
Age 65-69	Number (n)	35	17	45	30	80	47
	Maximum	10.37	12.77	8.13	6.93	10.37	12.77
	Minimum	1.20	0.80	0.70	1.47	0.70	0.80
	Mean	4.39	4.37	2.91	3.08	3.56	3.55
	Std Deviation	2.20	2.79	1.69	1.60	2.06	2.20
	Variance	4.86	7.79	2.86	2.55	4.26	4.83
Age 20-40	Number (n)	28	28	34	36	62	64
	Maximum	10.27	9.73	9.40	8.93	10.27	9.73
	Minimum	0.70	1.00	0.53	0.20	0.53	0.20
	Mean	3.96	4.39	3.06	3.19	3.47	3.71
	Std Deviation	2.17	2.63	1.95	1.78	2.10	2.27
	Variance	4.72	6.93	3.79	3.17	4.41	5.17

Maneuver times by gender

Day Time		Freeway		Arterial		All	
		M	F	M	F	M	F
Age 70+	Number (n)	47	32	55	48	102	80
	Maximum	25.50	23.83	15.63	18.93	25.50	23.83
	Minimum	2.20	1.87	2.47	2.87	2.20	1.87
	Mean	8.97	6.51	7.62	7.31	8.24	6.99
	Std Deviation	5.04	3.74	3.04	3.27	4.14	3.49
	Variance	25.41	13.98	9.25	10.72	17.15	12.18
Age 65-69	Number (n)	26	32	33	47	59	79
	Maximum	35.40	18.23	16.17	22.20	35.40	22.20
	Minimum	2.43	1.27	3.23	3.27	2.43	1.27
	Mean	10.06	7.06	6.51	7.49	8.07	7.32
	Std Deviation	6.75	3.78	2.58	4.68	5.19	4.34
	Variance	45.61	14.26	6.65	21.91	26.93	18.86
Age 20-40	Number (n)	25	23	39	35	64	58
	Maximum	15.30	14.60	22.03	21.03	22.03	21.03
	Minimum	3.30	1.07	2.17	3.67	2.17	1.07
	Mean	6.62	6.96	6.99	8.06	6.85	7.62
	Std Deviation	3.02	3.12	4.01	3.99	3.66	3.71
	Variance	9.14	9.75	16.10	15.90	13.42	13.75
Night Time							
Age 70+	Number (n)	31	10	45	11	76	21
	Maximum	17.83	14.83	28.63	15.07	28.63	15.07
	Minimum	2.27	2.17	2.93	3.40	2.27	2.17
	Mean	7.11	7.18	7.76	8.28	7.50	7.76
	Std Deviation	3.80	3.84	4.62	3.27	4.31	3.59
	Variance	14.42	14.76	21.31	10.67	18.60	12.92
Age 65-69	Number (n)	35	14	44	29	79	43
	Maximum	20.13	12.27	13.50	22.60	20.13	22.60
	Minimum	2.03	1.23	1.40	2.40	1.40	1.23
	Mean	7.61	7.34	6.51	7.36	7.00	7.35
	Std Deviation	3.68	3.44	2.42	4.50	3.09	4.19
	Variance	13.55	11.82	5.86	20.28	9.57	17.52
Age 20-40	Number (n)	27	27	32	33	59	60
	Maximum	23.40	23.80	15.30	20.80	23.40	23.80
	Minimum	2.53	2.03	1.70	2.67	1.70	2.03
	Mean	7.84	6.87	6.99	6.89	7.38	6.88
	Std Deviation	4.11	4.50	3.57	3.80	3.85	4.13
	Variance	16.89	20.21	12.71	14.41	14.80	17.02

Cues Responded To by Age, Situation, and Day/Night Condition.

Site	Age Group	Day				Night			
		n	Signs	Lane Markings	Other	n	Signs	Lane Markings	Other
1. Freeway Lane Drop	20-40	10	90%	10%	0%	11	82%	18%	0%
	65-69	15	93%	7%	0%	13	85%	15%	0%
	70+	14	71%	22%	7%	8	88%	12%	0%
2. Freeway Lane Drop	20-40	12	67%	33%	0%	12	50%	50%	0%
	65-69	13	77%	23%	0%	12	42%	58%	0%
	70+	21	43%	57%	0%	11	36%	64%	0%
3. Arterial Turn Lane	20-40	13	0%	0%	100%	4	0%	0%	100%
	65-69	15	0%	0%	100%	4	0%	0%	100%
	70+	21	0%	0%	100%	4	0%	0%	100%
4. Arterial Turn Lane	20-40	12	50%	50%	0%	12	58%	42%	0%
	65-69	14	57%	43%	0%	13	46%	54%	0%
	70+	18	44%	50%	6%	9	11%	78%	11%
5. ArterialTurn Lane	20-40	14	7%	93%	0%	14	50%	50%	0%
	65-69	16	19%	81%	0%	15	13%	87%	0%
	70+	20	15%	85%	0%	12	0%	100%	0%
6. Complex Intersection	20-40	13	0%	100%	0%	14	14%	86%	0%
	65-69	13	0%	100%	0%	13	0%	100%	0%
	70+	17	0%	100%	0%	13	0%	100%	0%
7. Freeway Lane Drop	20-40	11	36%	64%	0%	11	55%	45%	0%
	65-69	12	33%	67%	0%	9	22%	78%	0%
	70+	18	22%	78%	0%	11	9%	91%	0%
8. Freeway Lane Drop	20-40	10	60%	40%	0%	12	75%	25%	0%
	65-69	11	64%	36%	0%	9	56%	44%	0%
	70+	14	50%	42%	8%	10	50%	40%	10%
9. Freeway Lane Drop	20-40	6	83%	17%	0%	10	70%	30%	0%
	65-69	8	75%	25%	0%	9	67%	33%	0%
	70+	15	47%	47%	6%	4	25%	50%	25%
11. Arterial Turn Lane	20-40	13	69%	31%	0%	13	85%	15%	0%
	65-69	13	62%	38%	0%	15	60%	40%	0%
	70+	18	56%	44%	0%	11	36%	64%	0%
12. Arterial Turn Lane	20-40	11	0%	90%	10%	12	33%	67%	0%
	65-69	14	0%	93%	7%	15	7%	93%	0%
	70+	14	0%	79%	21%	12	8%	92%	0%

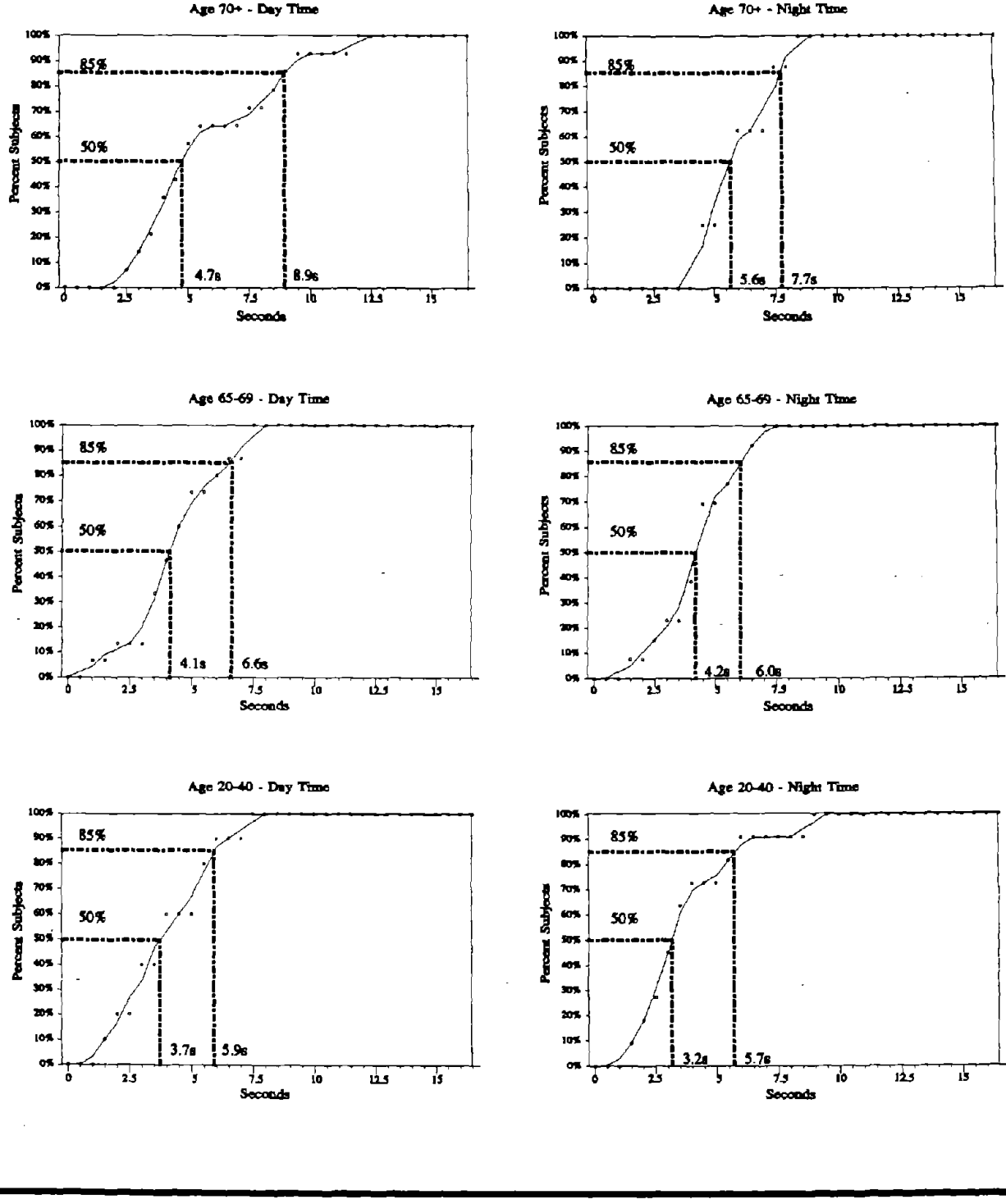
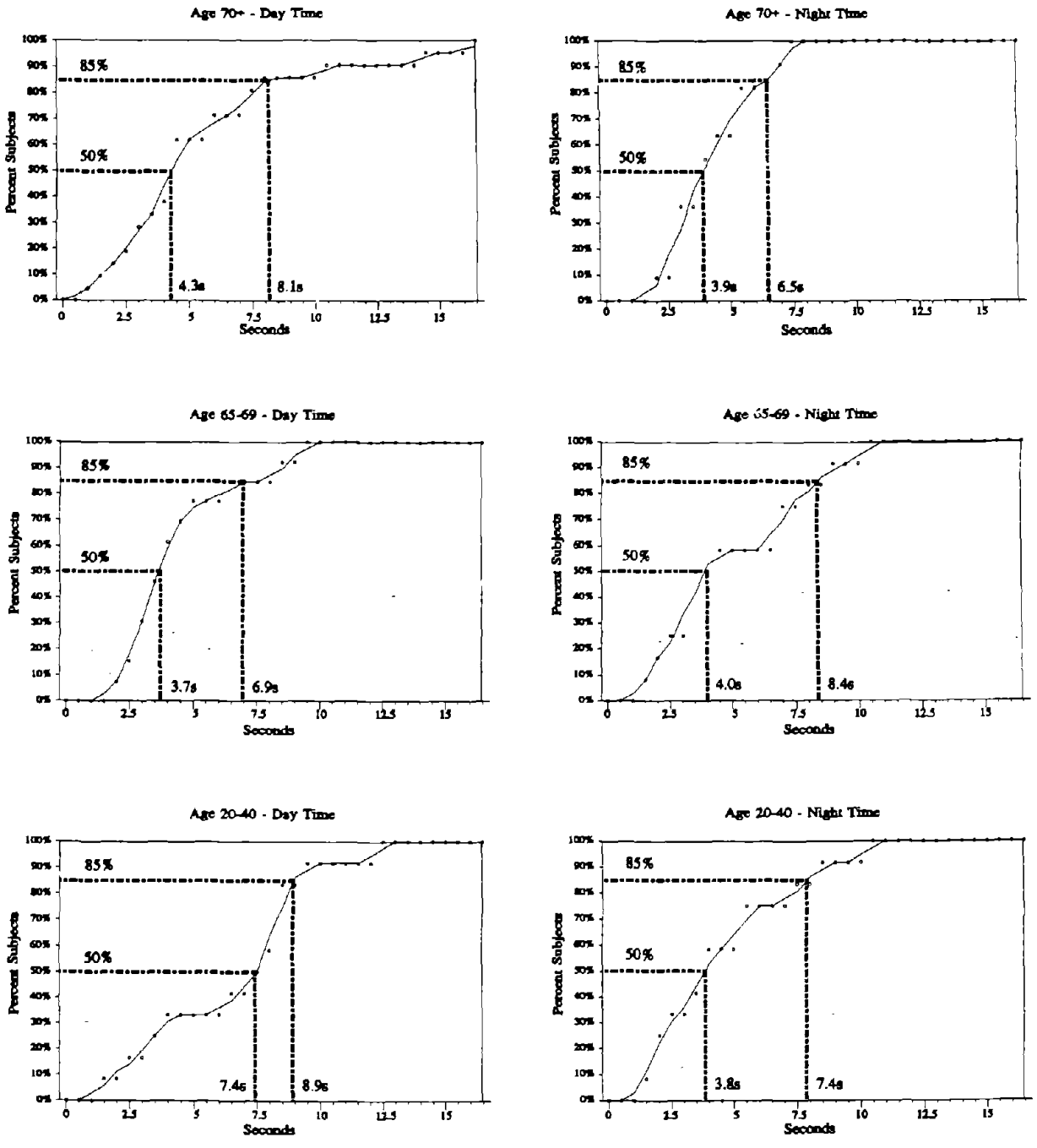


Figure 86. Frequency distribution of PRT at site 1.

Frequency Distribution of PRT at Site 1



Frequency Distribution of PRT at Site 2

Figure 87. Frequency distribution of PRT at site 2.

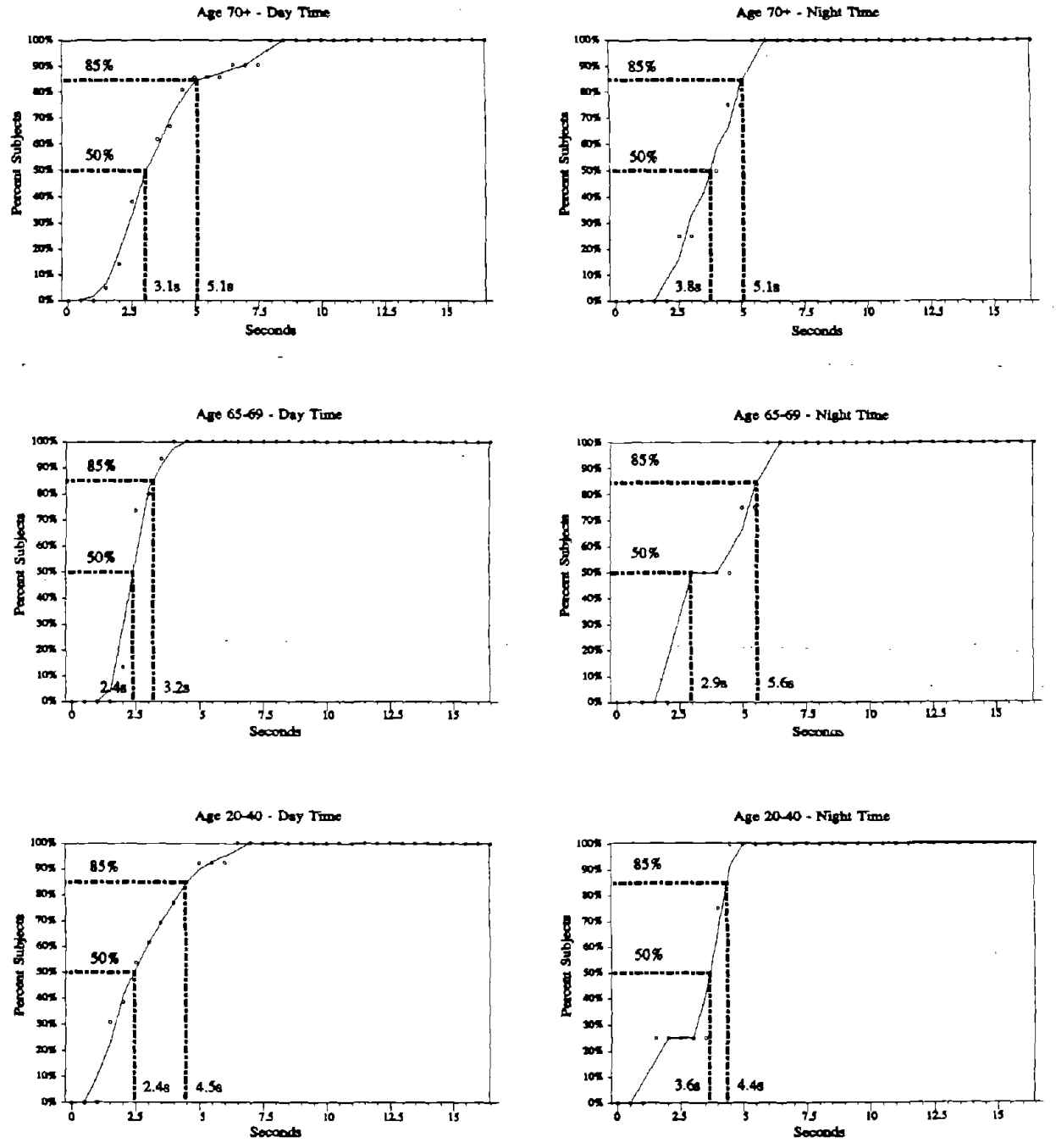


Figure 88. Frequency distribution of PRT at site 3.

Frequency Distribution of PRT at Site 3

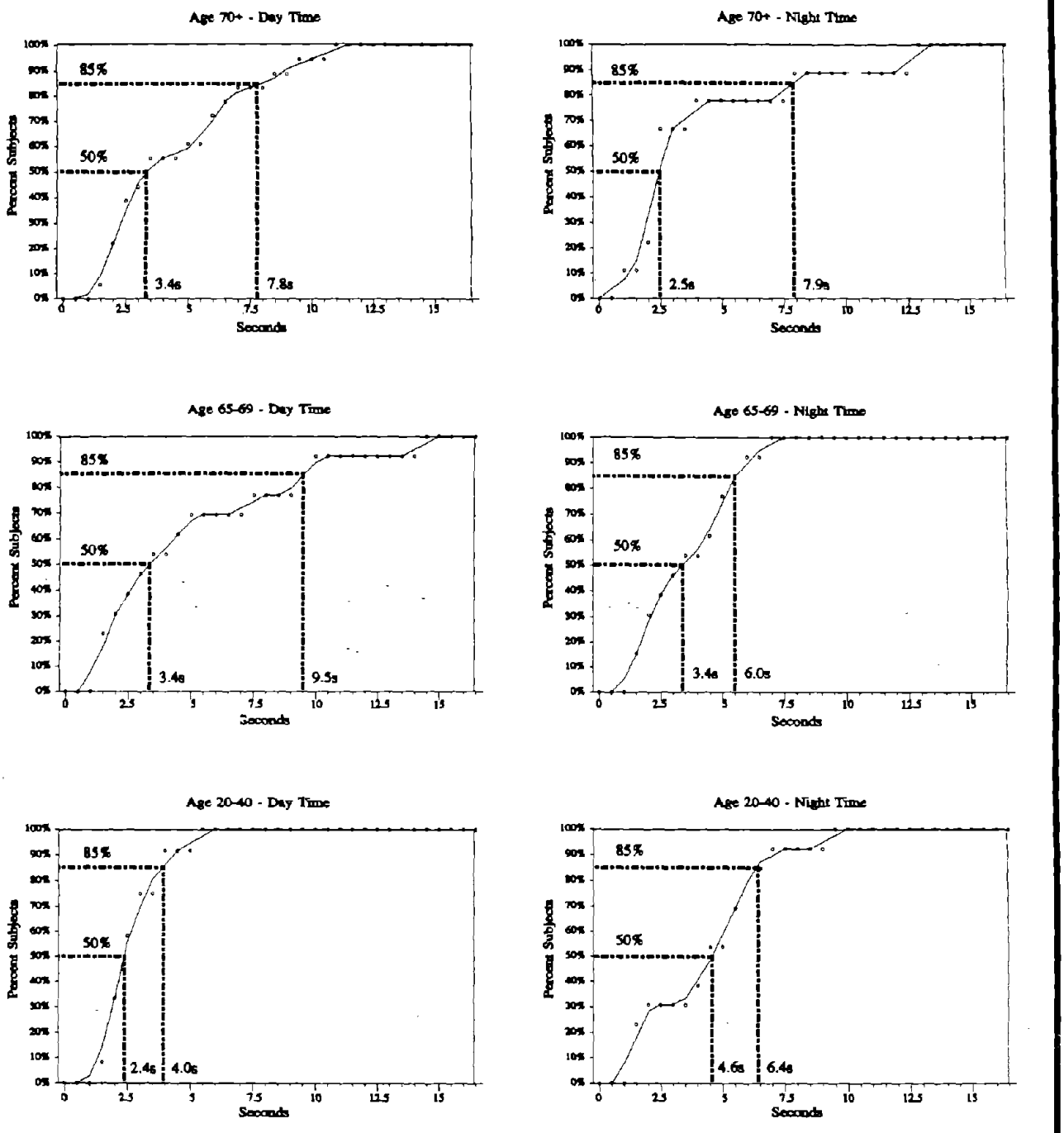


Figure 89. Frequency distribution of PRT at site 4.

Frequency Distribution of PRT at Site 4

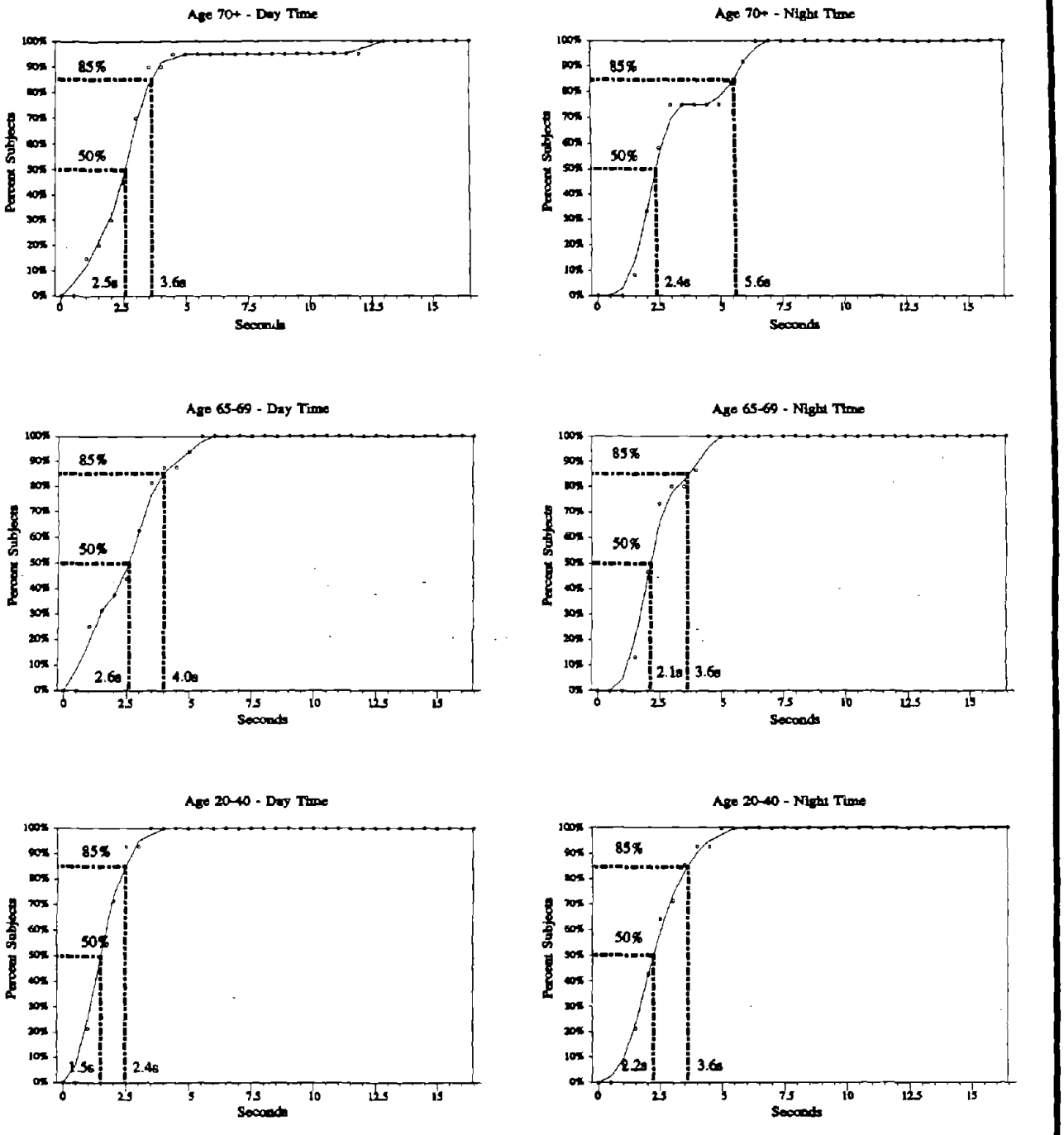


Figure 90. Frequency distribution of PRT at site 5.

Frequency Distribution of PRT at Site 5

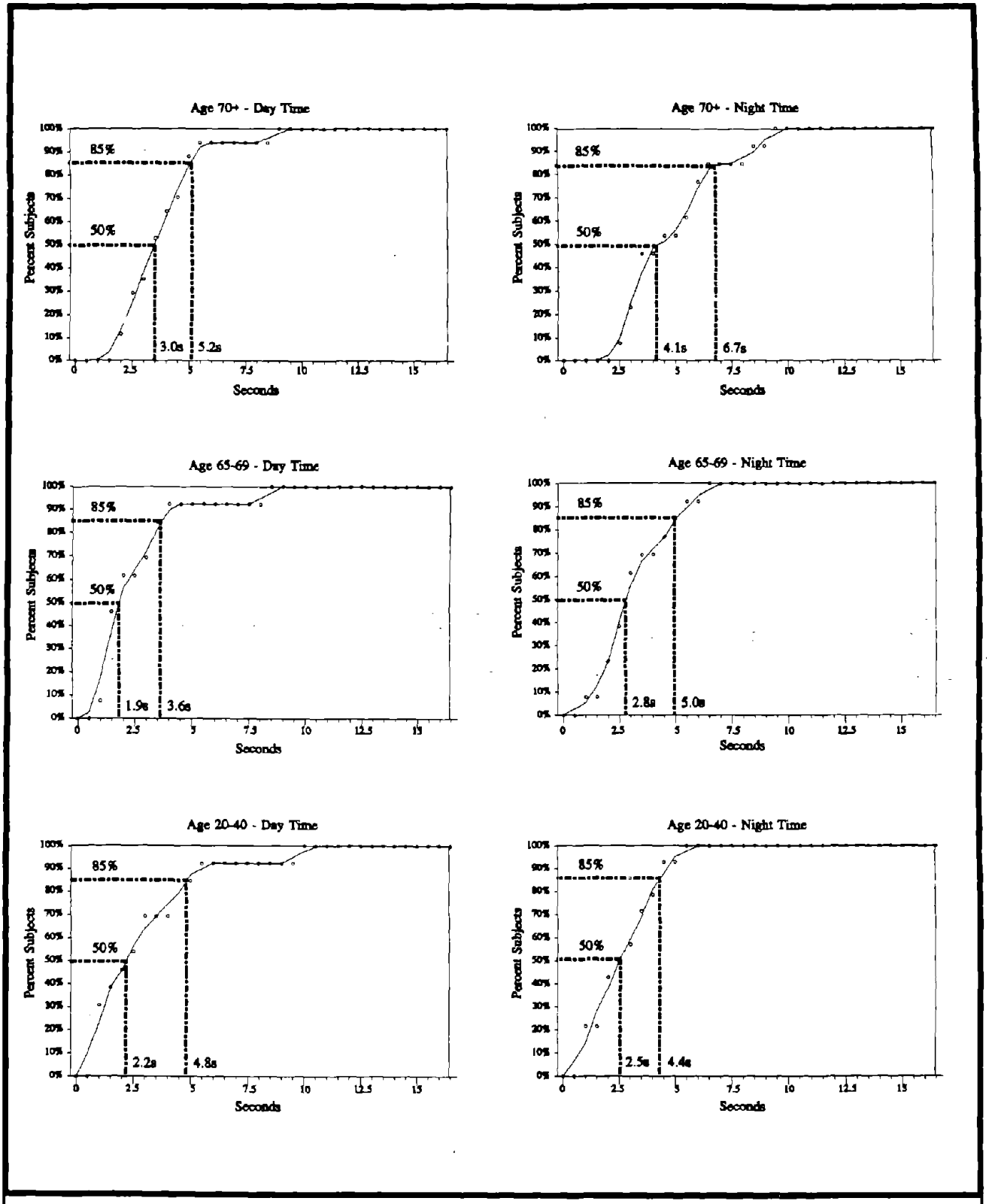
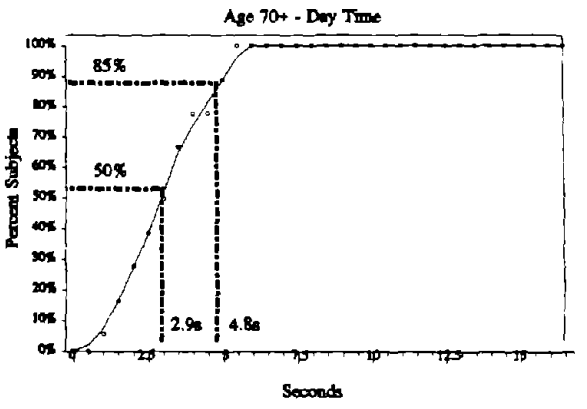
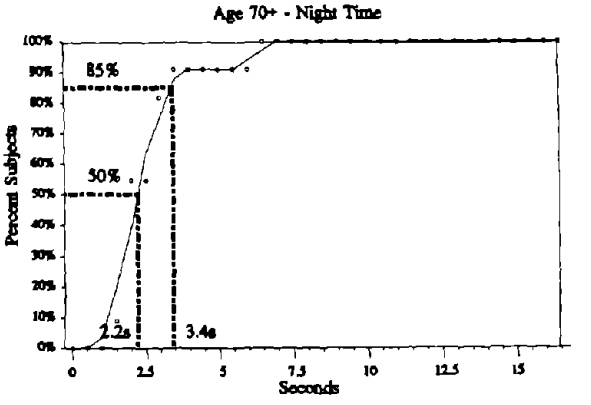
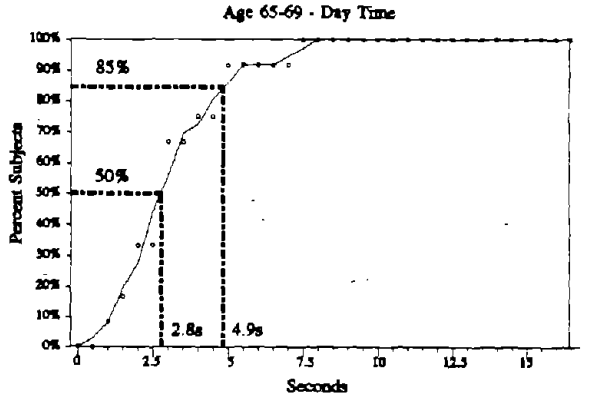


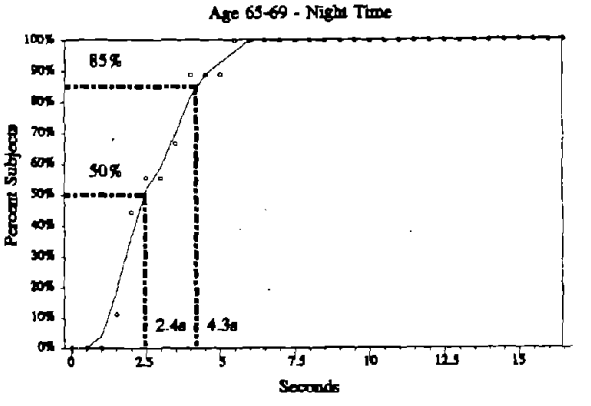
Figure 91. Frequency distribution of PRT at site 6.

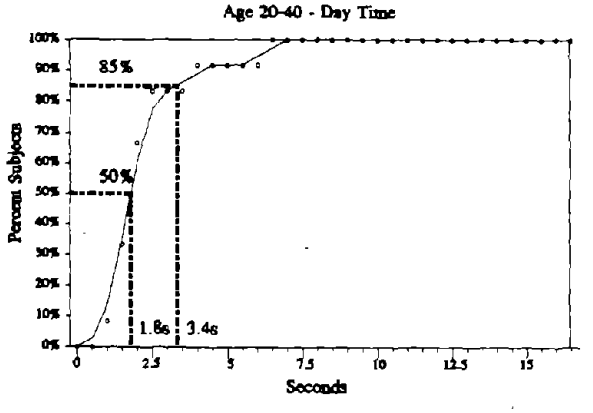
Frequency Distribution of PRT at Site 6











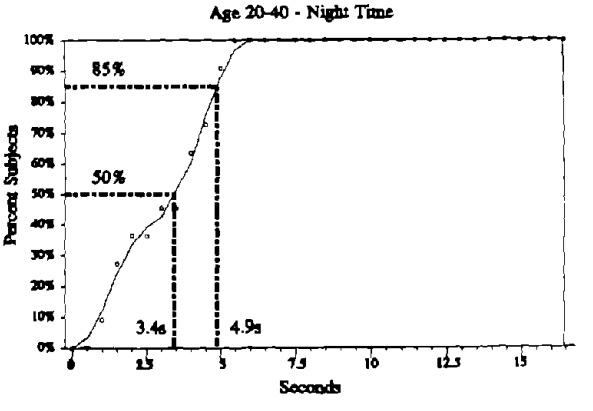
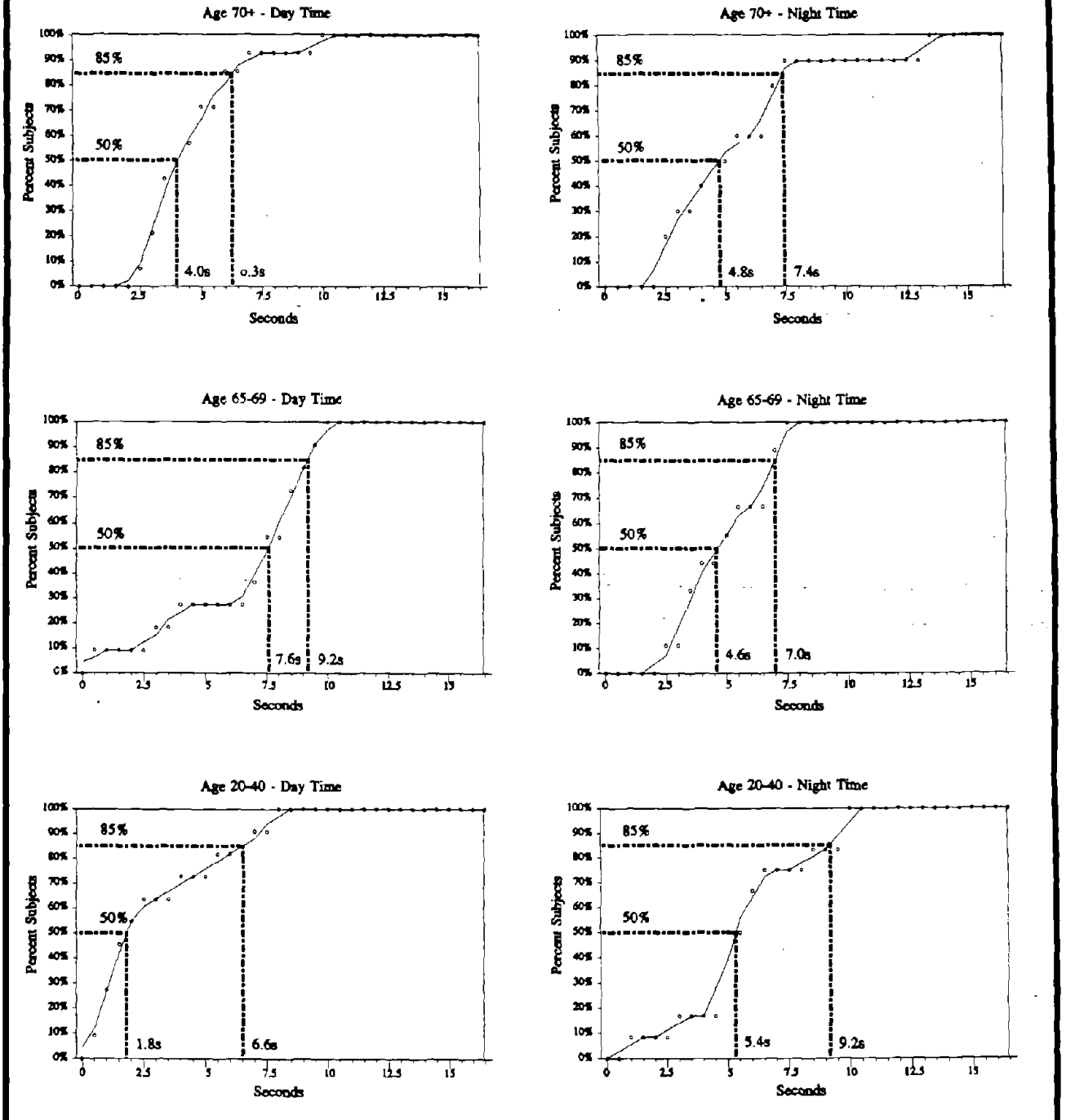


Figure 92. Frequency distribution of PRT at site 7.

Frequency Distribution of PRT at Site 7



Frequency Distribution of PRT at Site 8

Figure 93. Frequency distribution of PRT at site 8.

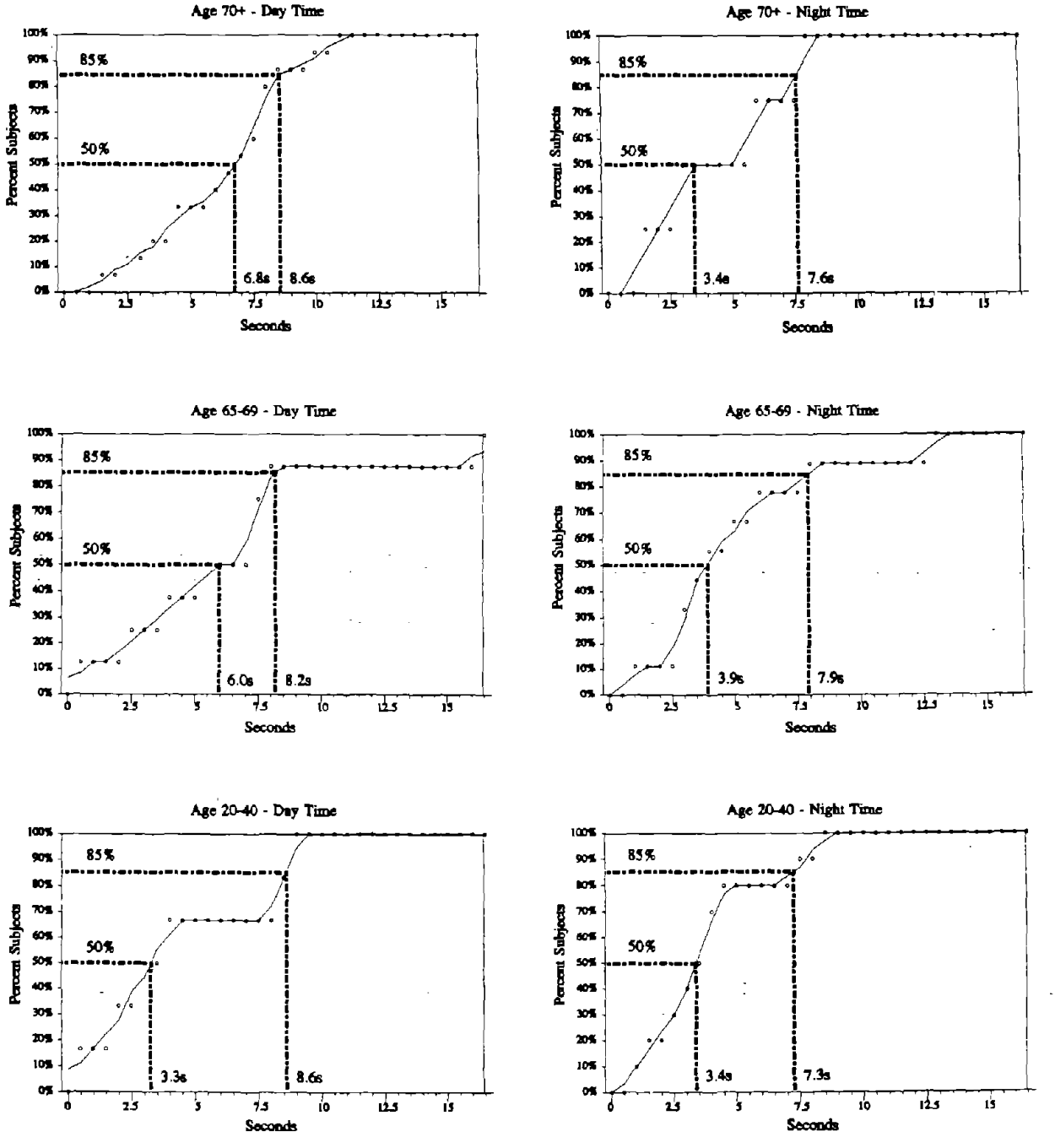
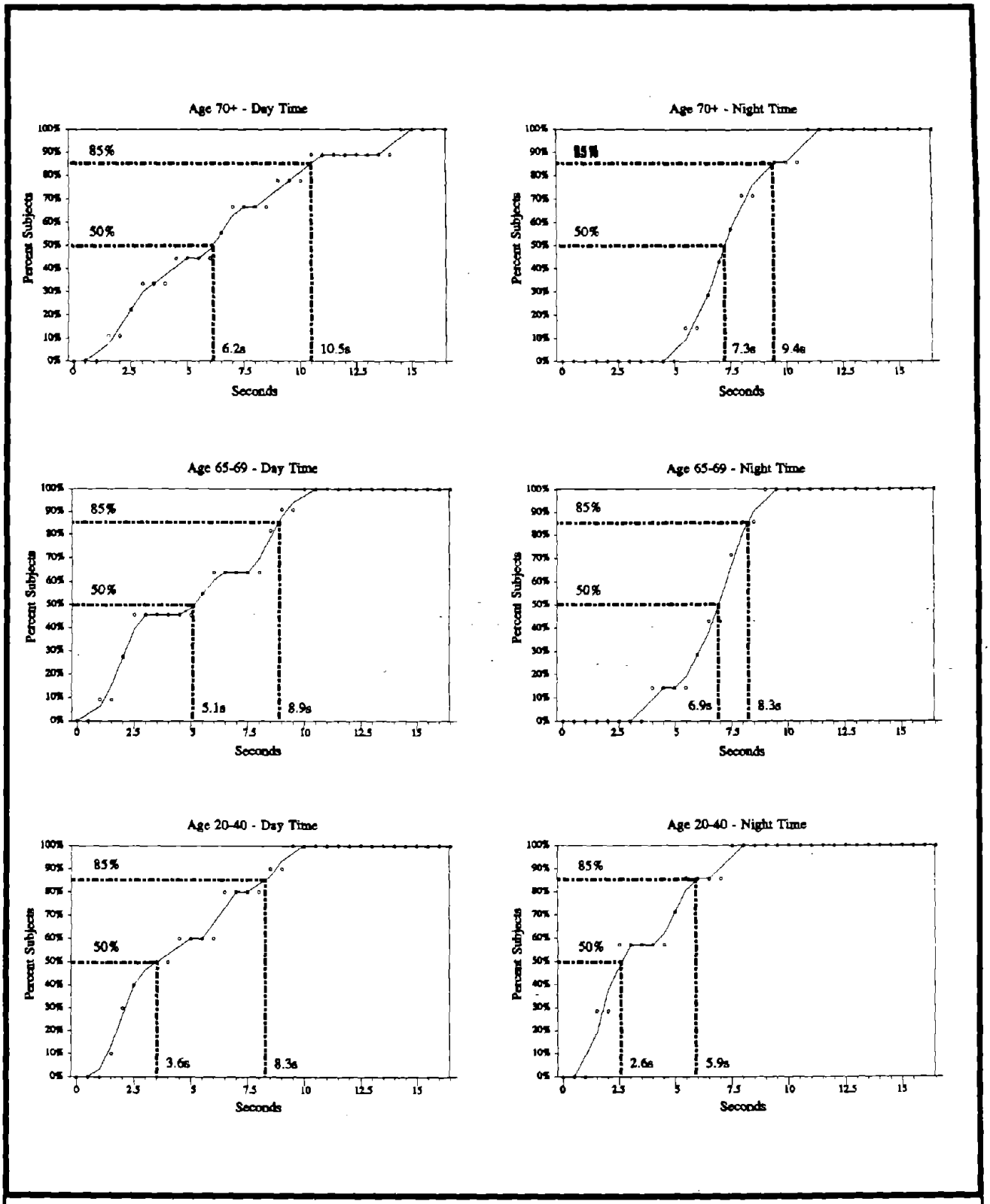


Figure 94. Frequency distribution of PRT at site 9.

Frequency Distribution of PRT at Site 9



Frequency Distribution of PRT at Site 10

Figure 95. Frequency distribution of PRT at site 10.

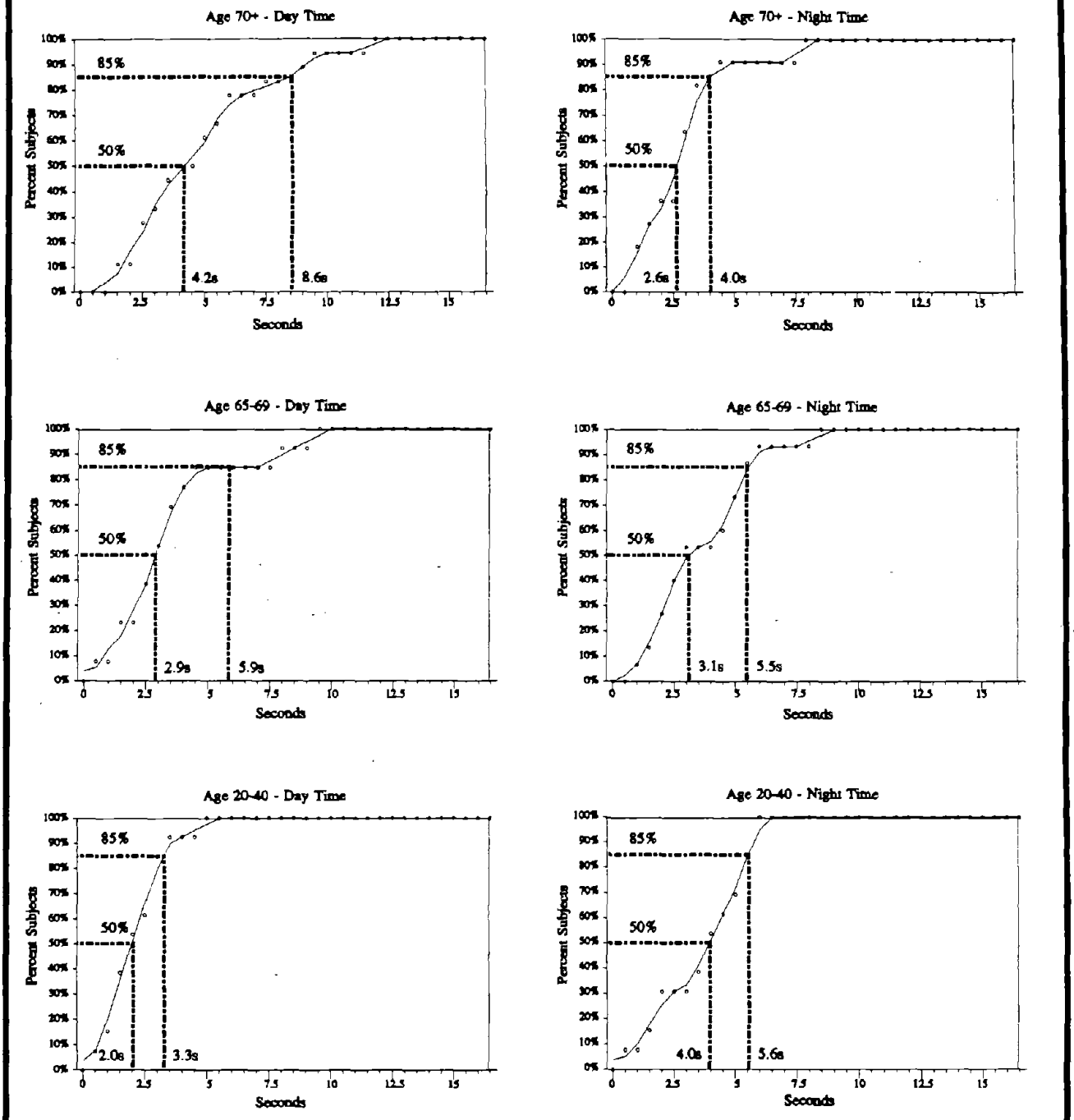


Figure 96. Frequency distribution of PRT at site 11.

Frequency Distribution of PRT at Site 11

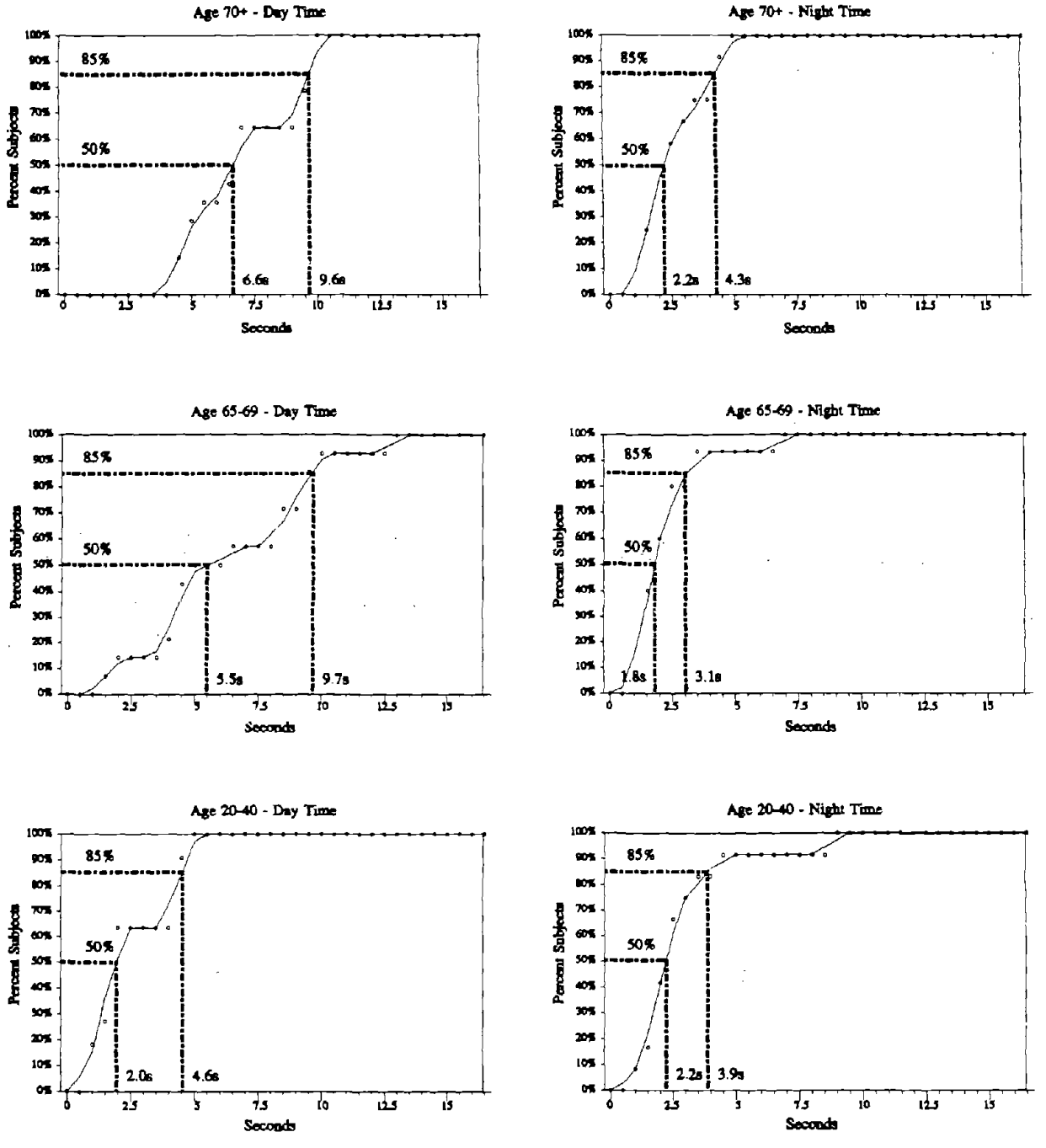


Figure 97. Frequency distribution of PRT at site 12.

Frequency Distribution of PRT at Site 12

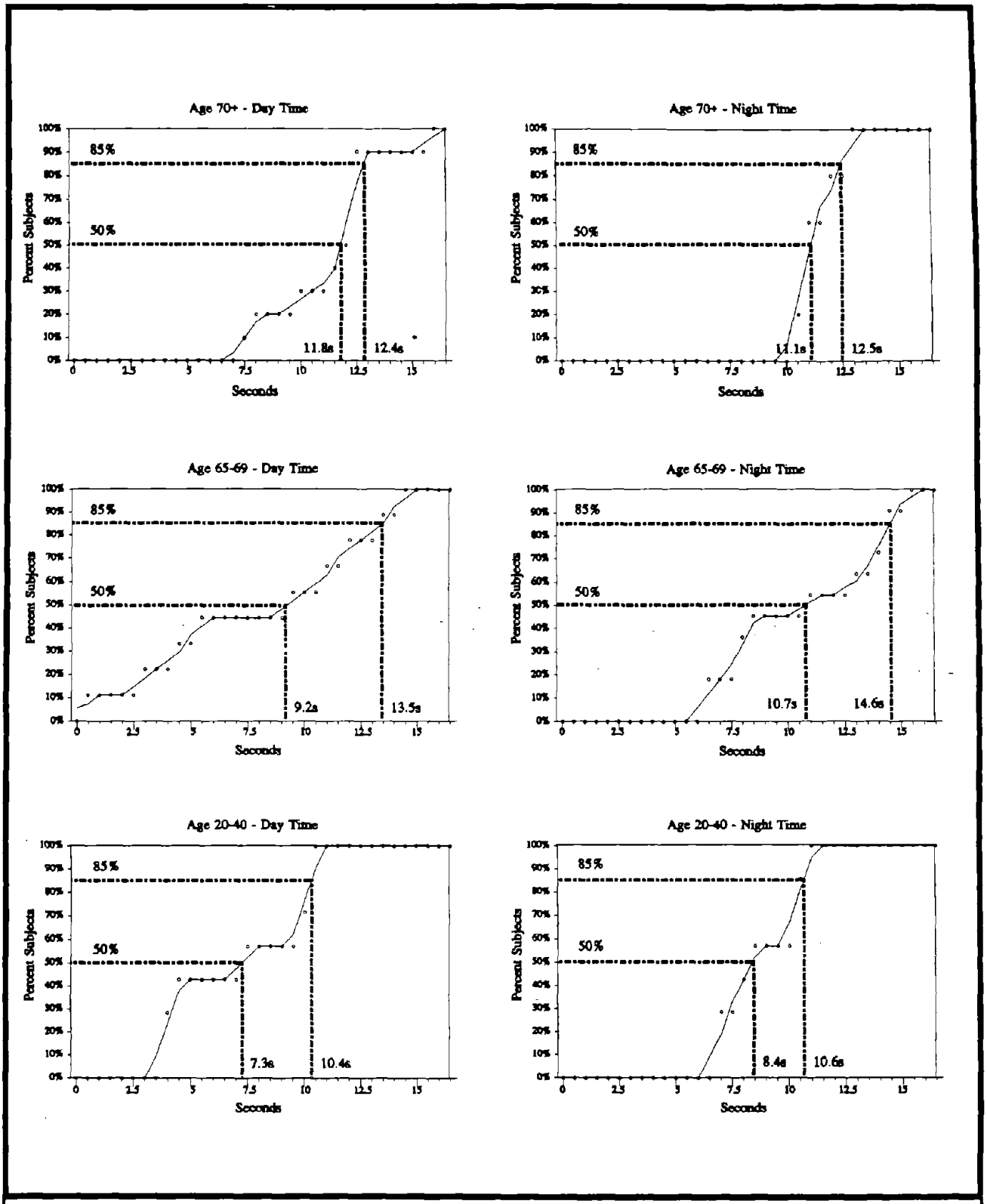


Figure 98. Frequency distribution of PRT at site 13.

Frequency Distribution of PRT at Site 13

APPENDIX D. GAP/LAG ACCEPTANCE EXPERIMENT

INSTRUCTIONS TO SUBJECTS

The purpose of this study is to see what kind of gaps in traffic drivers require before they are willing to turn onto, or cross, a highway. I will be asking you about some particular driving action: turning right, turning left, or crossing the road. You will be making judgments about when it is safe or unsafe to make the maneuver. You won't actually be making the maneuver. All your judgments will be made from here in the parked car. What we want to find out is what you would do if you were actually driving your car here, and we were at an intersection with a stop sign.

A very important point to keep in mind is that there are no "right" or "wrong" decisions. We are here to learn from you. It is important that you view the traffic and make a decision about whether it is OK to go, just as you would if you were driving by yourself in your own car. You must think like a driver who is on his/her way somewhere, waiting at a stop sign at an intersection. Imagine that you are on a blacktop roadway surface in your own car.

Now let me give you the details of how we will dc this. First, I will tell you the driving maneuver we want to make. For example, I may say we want to turn right. Then you would start viewing traffic and thinking about whether you can make the turn, just as you do when you are driving. You have a button with two positions. At any given moment you will have the button in one position or the other. If you would be willing to push the accelerator pedal and move into traffic at this moment, the button should be depressed as you would with your gas pedal. If you would not be willing to move forward now, you should stop depressing the button and let it spring back to its resting position. You should change the position of the button as soon as your decision about whether to go now or stay for now changes. In this way, at any given moment, we should be able to tell whether, if you were really driving, you would be willing to press the accelerator and move ahead. Remember that what you need to tell us is whether it's safe to go or not if you were driving your car. This may seem a little unnatural at first, but concentrate on whether you would feel comfortable pulling into or through the traffic for the prescribed maneuver.

You will be making these judgments for about 10-15 minutes for one driving maneuver, then we will switch to another maneuver. You will do this for all three possible maneuvers; turning right, turning left or driving straight through. Since there will be two of you making these judgments at the same time, some interference may take place. We definitely want you to try to see all of the oncoming traffic that could affect your judgments, but please try not to interfere with the other person's view, if possible. Also, pay no attention to the other person's judgments. It's very important that we get your individual impressions. Hold your buttons down by the seat near the outside arm rest, so that you cannot inadvertently influence each other.

Before we start for real, let's try a little practice. Lets say I ask you about whether it is safe to turn right. Go ahead and use your button now to let me know whether you would proceed or not. Remember to depress or release the button whenever your feeling about whether you could go changes.

[Monitor responses]

Good. Now let's try the same thing pretending you are trying to make a left turn.

[Monitor responses]

Now let's try it for crossing the road. Of course, you can see that there is not really a road going through here. We are not really at an intersection. But I need you to pretend this is really an intersection, and the road we are on continues right across the highway. Go ahead and make your judgments about whether it would be safe to proceed.

[Monitor responses]

Good. Now I will start the recording equipment and we can begin for real. Do you have any questions before we begin? ... Remember there are no "right" or "wrong" answers, or "good" or "bad" answers. It is all up to you. It is very important that you make your decisions just as you would if you were behind the wheel of your own car.

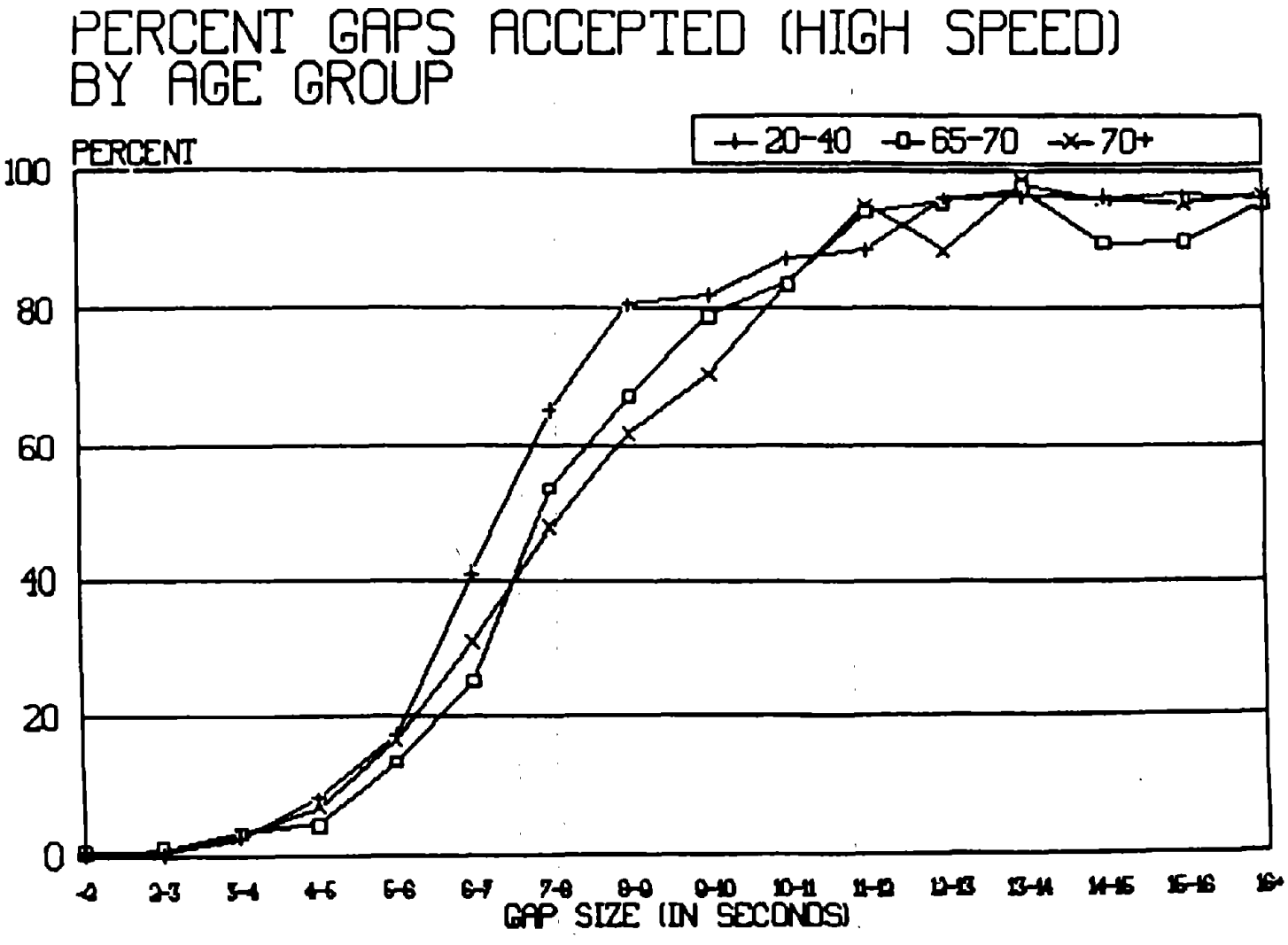


Figure 99. Percent gaps accepted (high-speed) by age group.

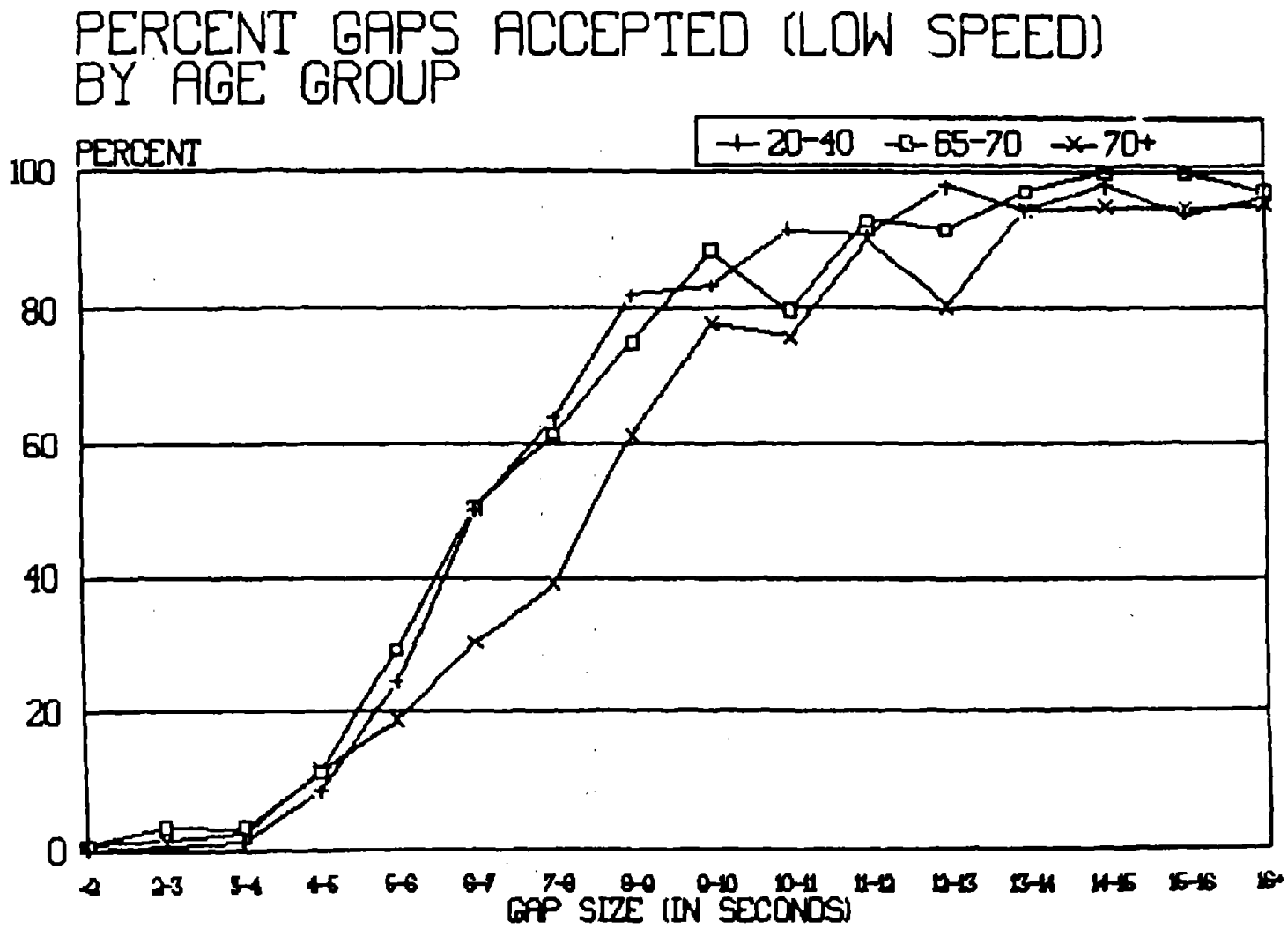


Figure 100. Percent gaps accepted (low-speed) by age group.

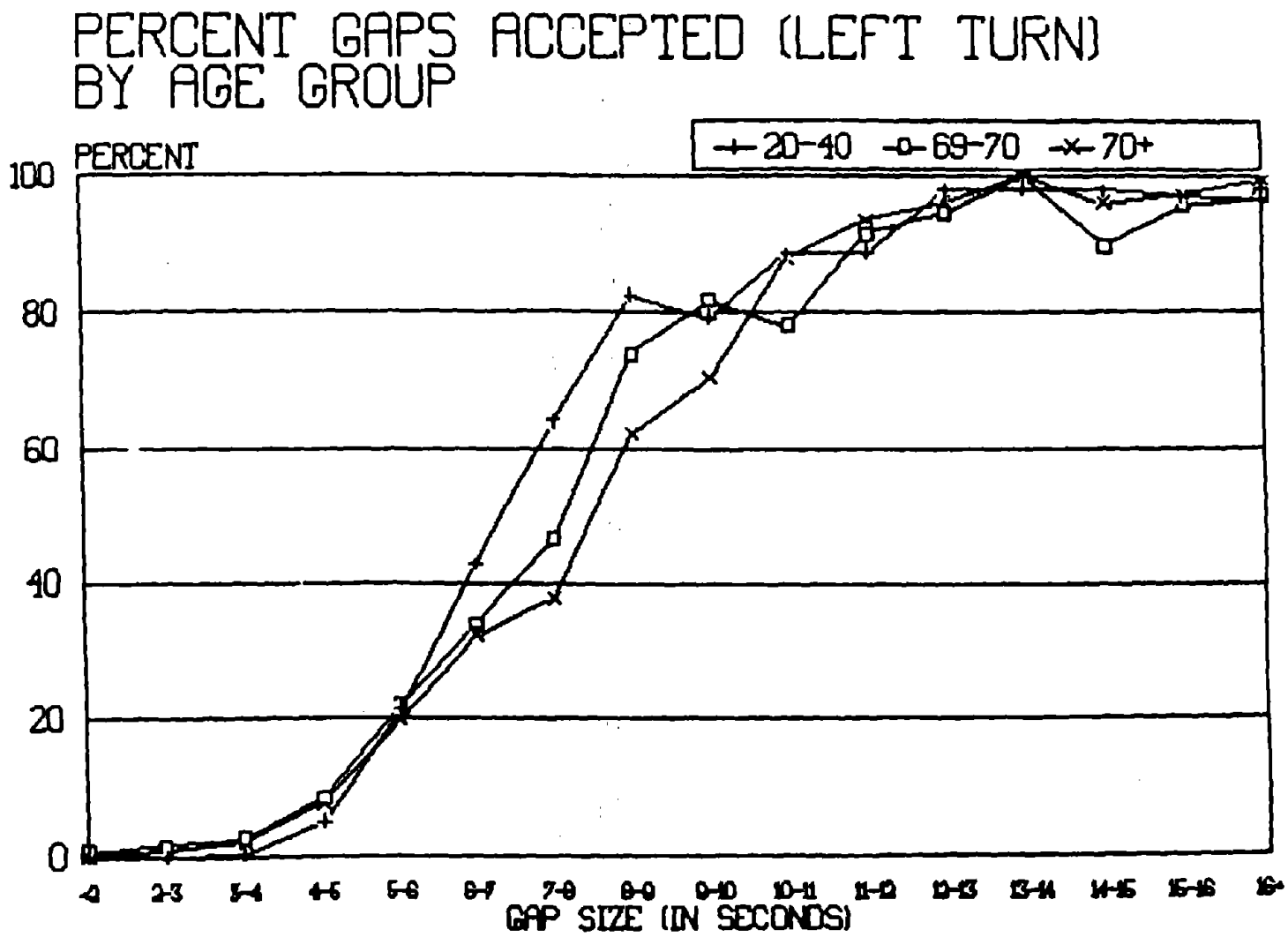


Figure 101. Percent gaps accepted (left-turn) by age group.

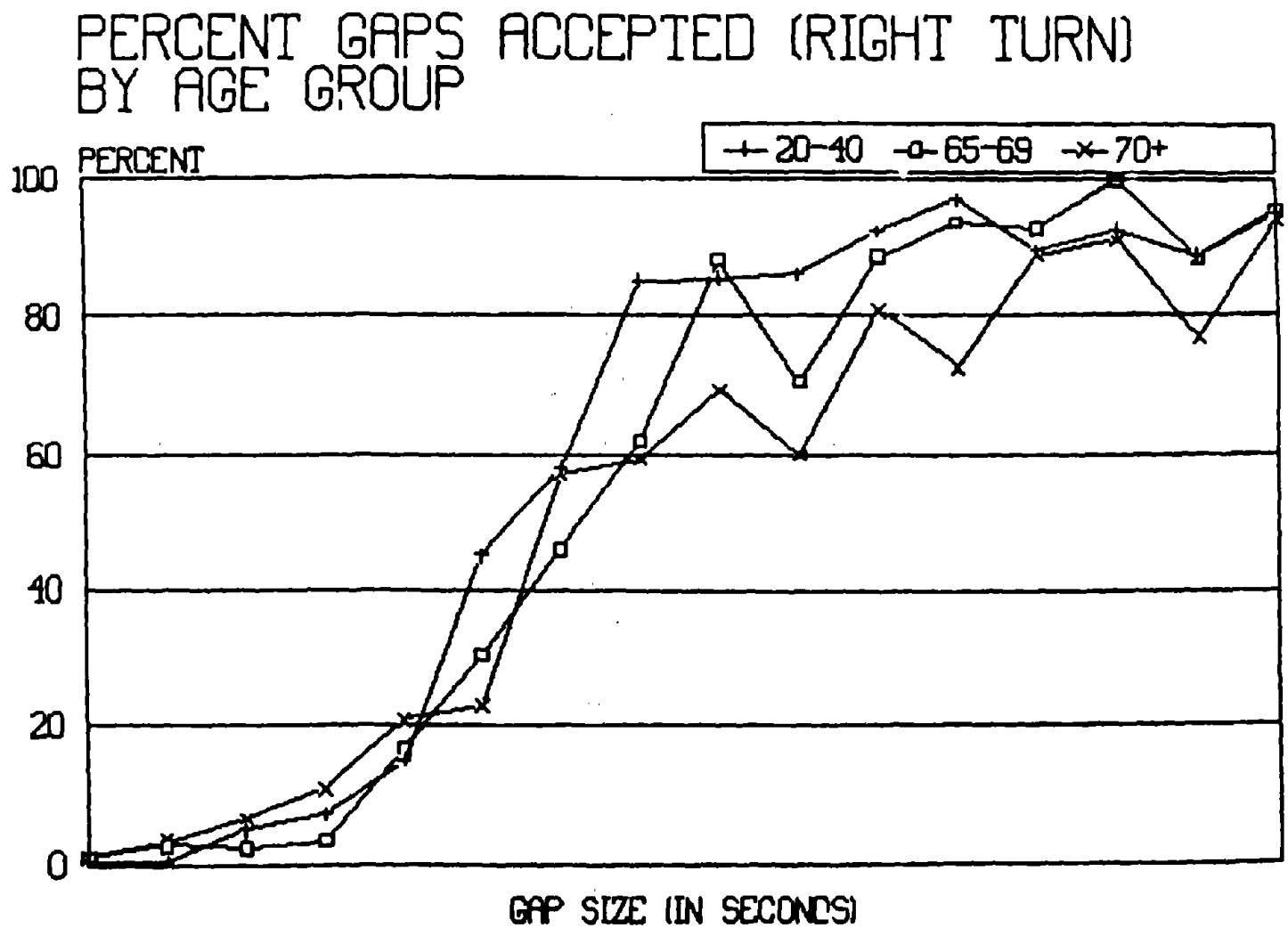


Figure 102. Percent gaps accepted (right-turn) by age group.

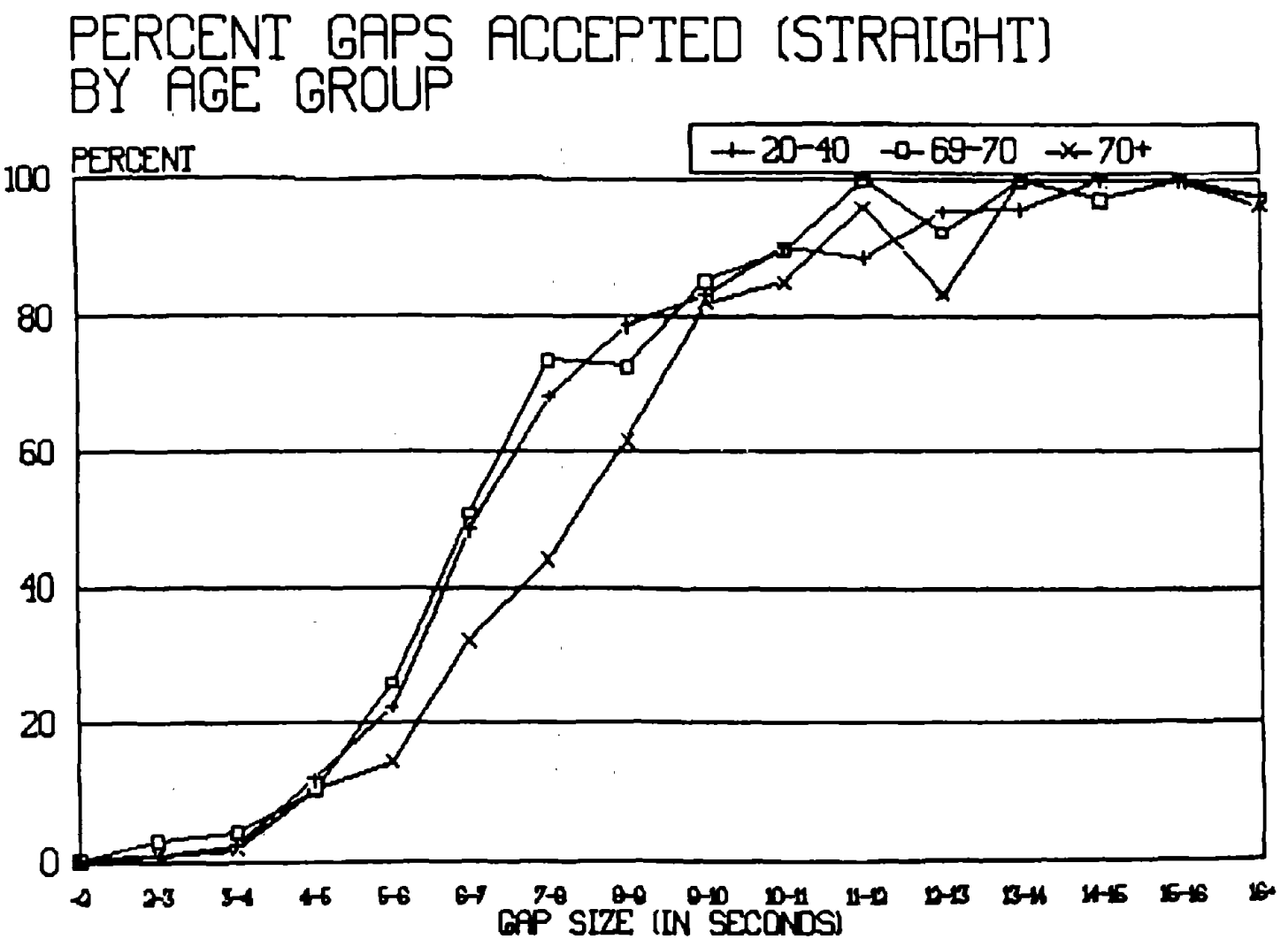


Figure 103. Percent gaps accepted (straight) by age group.

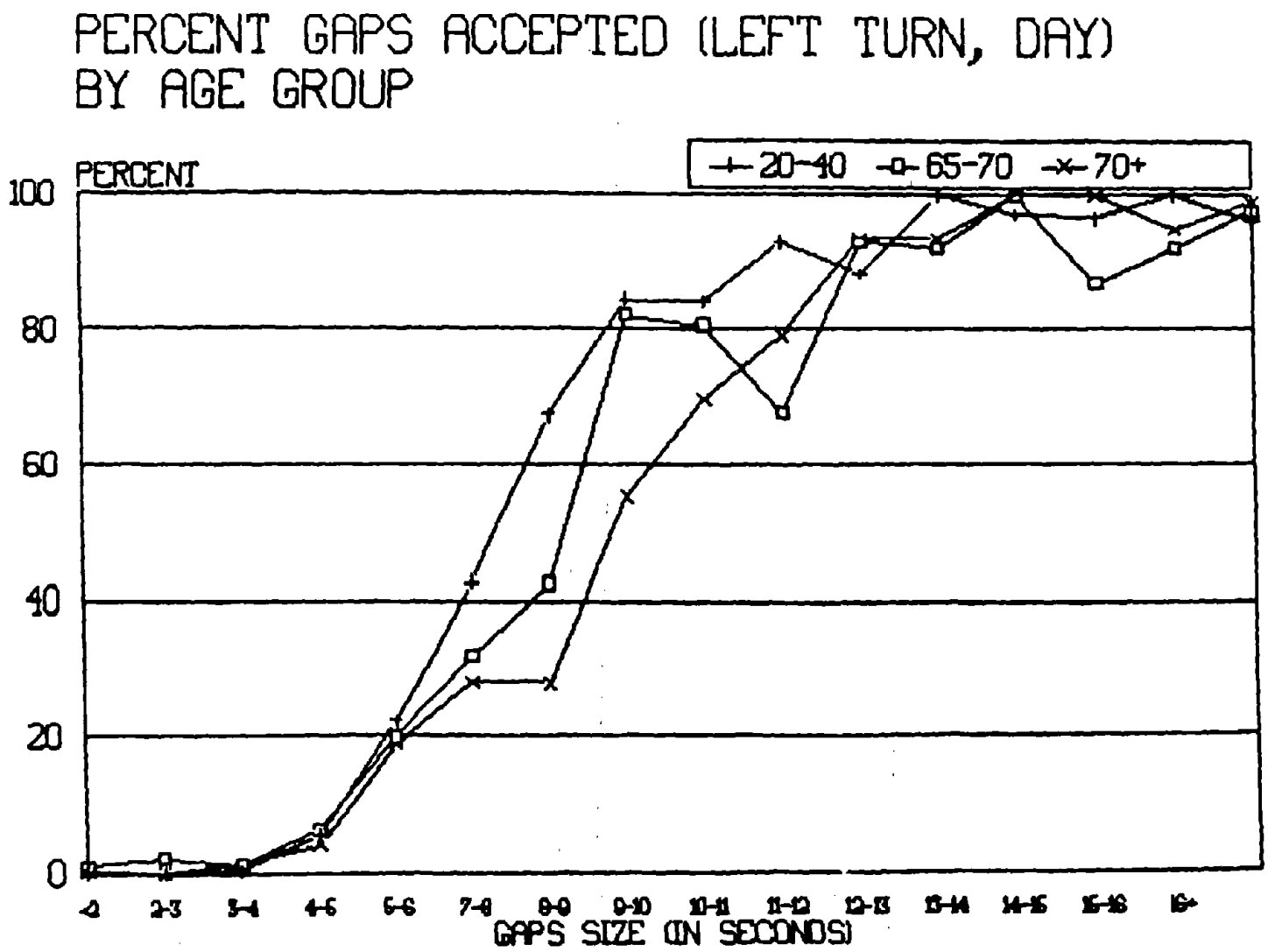


Figure 104. Percent gaps accepted (left-turn, day) by age group.

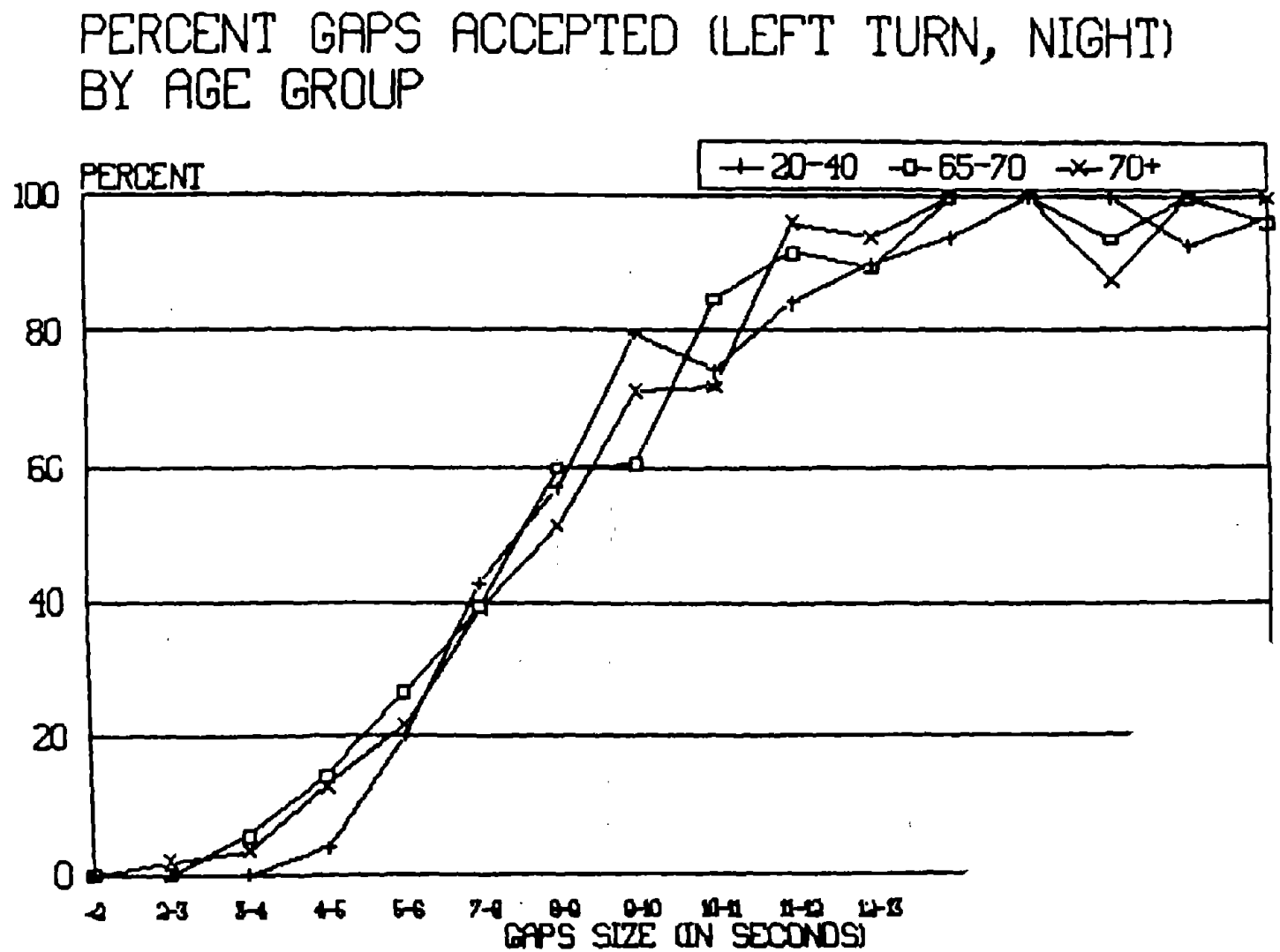


Figure 105. Percent gaps accepted (left-turn, night) by age group.

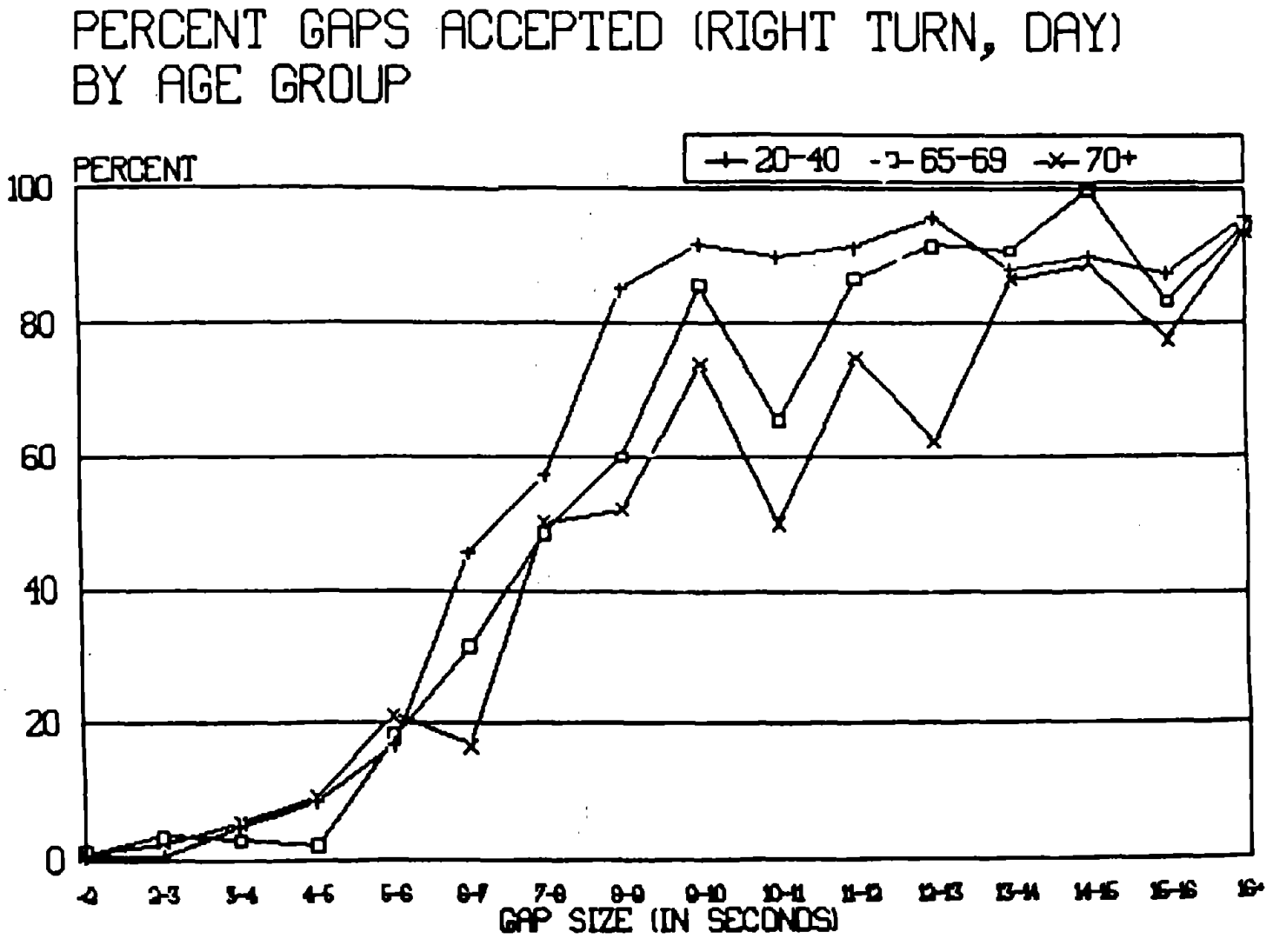


Figure 106. Percent gaps accepted (right-turn, day) by age group.

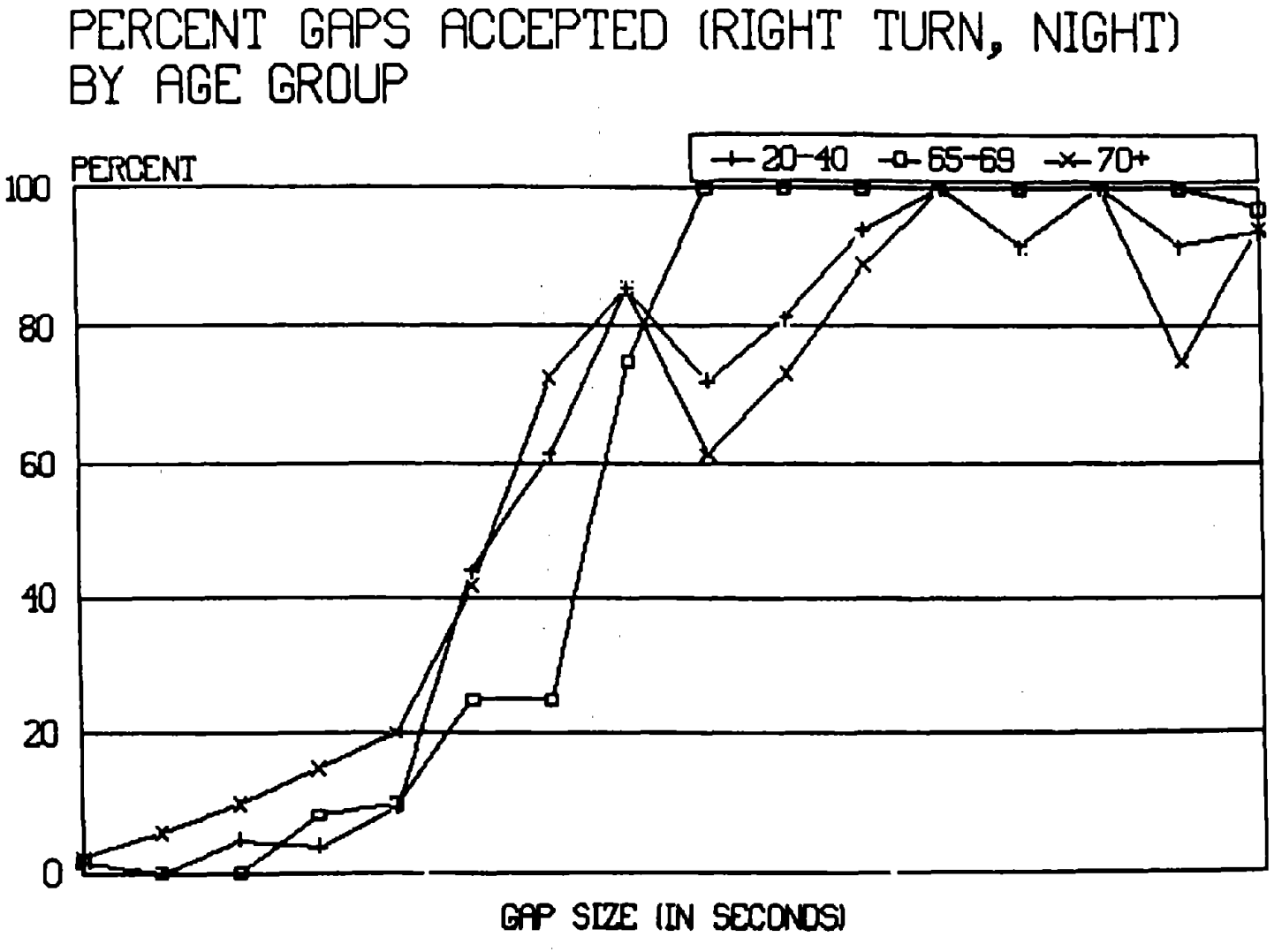


Figure 107. Percent gaps accepted (right-turn, night) by age group.

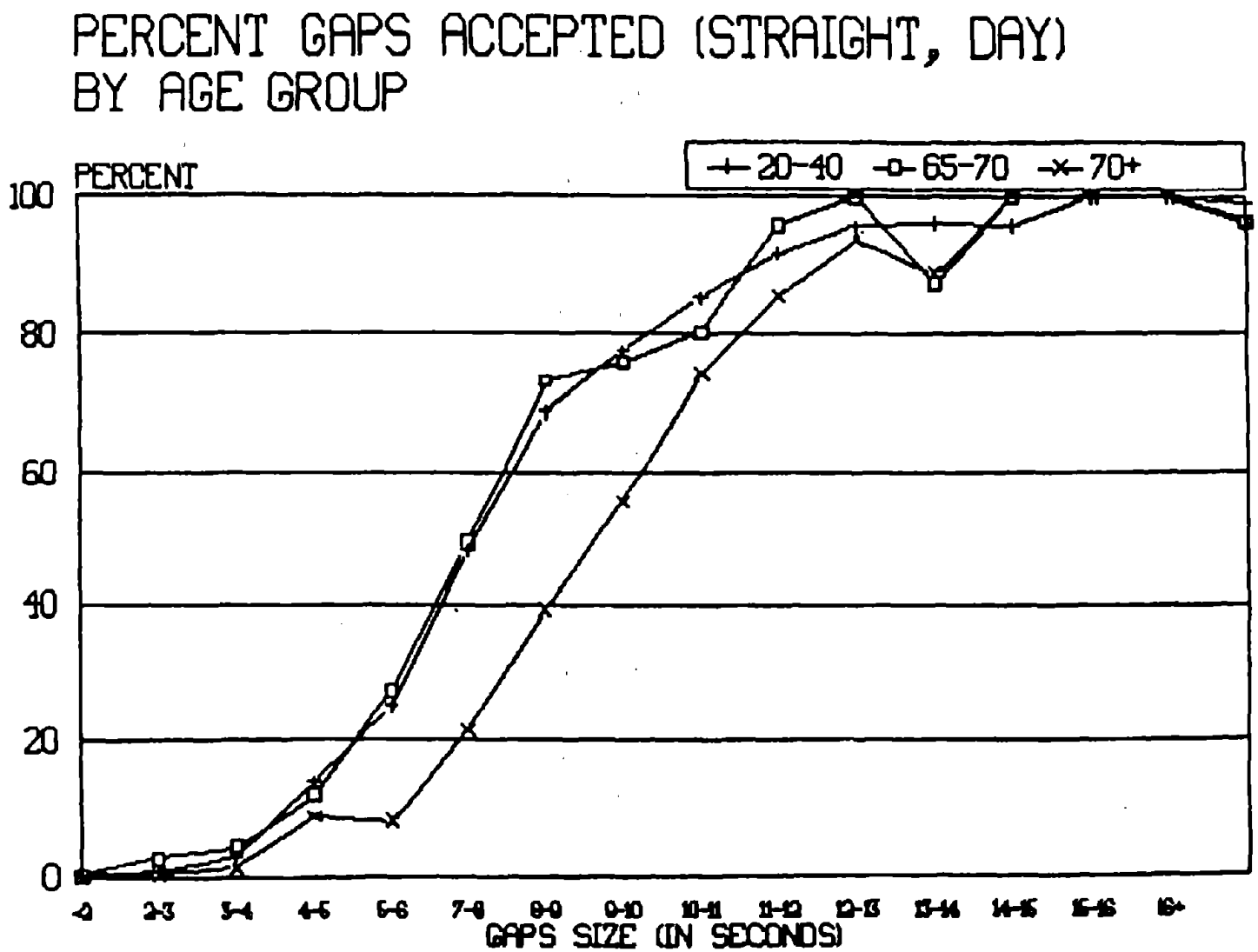


Figure 108. Percent gaps accepted (straight, day) by age group.

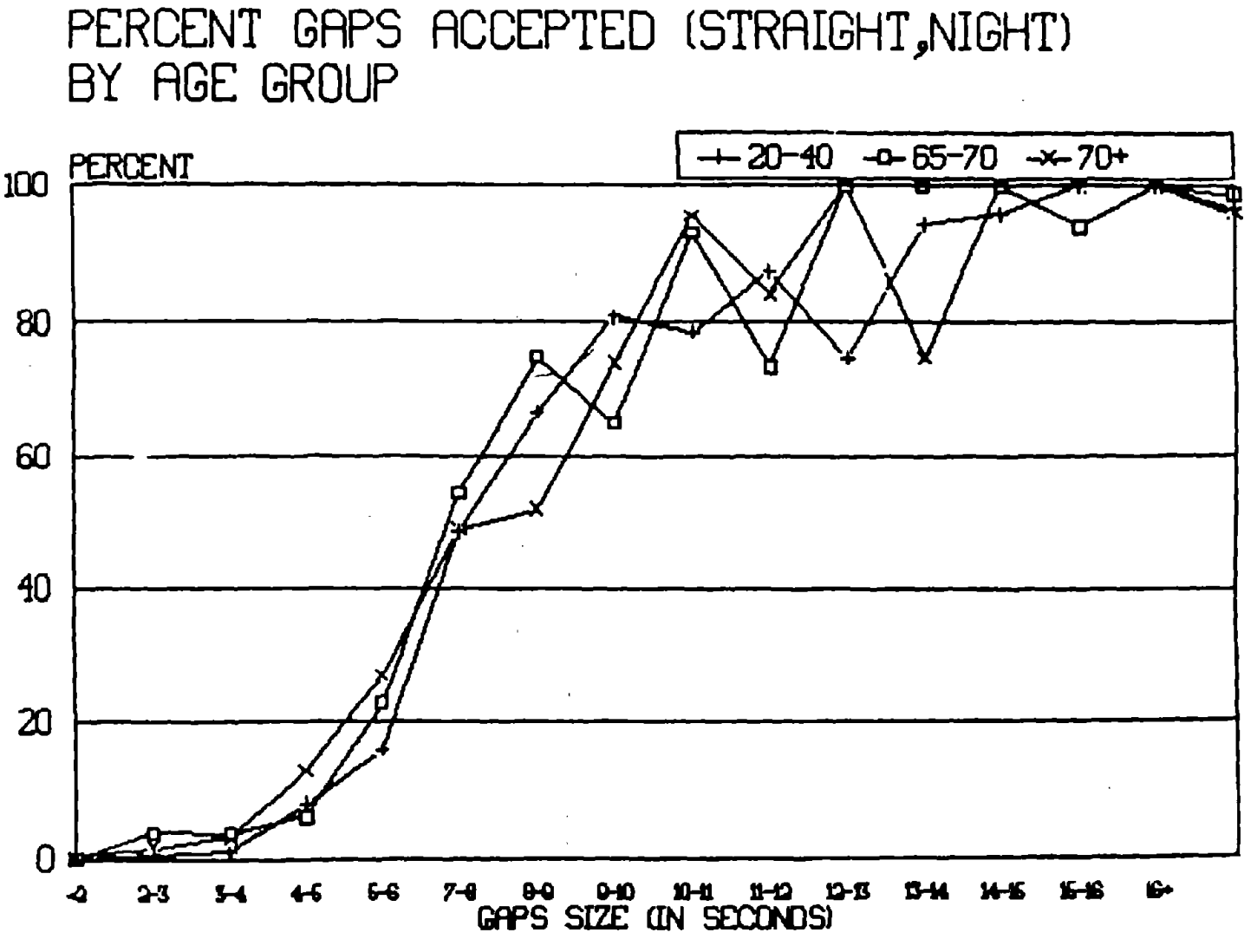


Figure 109. Percent gaps accepted (straight, night) by age group.