One limitation of the study is the lack of data about the mothers of the children studied. Only limited maternal information (age and gravidity) was uniformly recorded in the hospital birth records. Other maternal behaviors and exposures, such as tobacco, alcohol, and drug use, may be important for a more complete assessment of the outcomes studied. However, given the similarity of sociodemographic and behavioral characteristics between the fathers in the two cohorts, it seems unlikely that maternal characteristics would differ greatly. While we have extensive information on paternal characteristics in this study, very little is known about the association of paternal behaviors or exposures and birth defects in their children.

6.2 MISCLASSIFICATION ANALYSIS

The interview responses were not highly predictive of the presence of defects in hospital birth records for either veteran cohort. This could be due, in part, to the many birth defects that are discovered after the perinatal period and are not documented on birth records. While major external structural malformations (such as neural tube defects and cleft lip) are likely to be apparent at birth, other serious defects (including some cardiovascular abnormalities, pyloric stenosis, and some musculoskeletal defects) may not be ascertained until weeks or months after birth. While veterans could report these types of defects during the interview, their presence or absence cannot be verified based on birth records alone. The poor agreement between interview responses and birth records could also be due to problems in recall, the veterans' perceptions about what constitutes a birth defect, and lack of knowledge about the names of specific birth defects. While agreement was generally poor in both cohorts, positive interview responses from non-Vietnam veterans were slightly more predictive of the presence of a defect in the hospital birth record than were responses from Vietnam veterans. This difference in agreement is sufficient to account for the difference between the OR for veterans' reports and the lower records-based OR.

6.3 CEREBROSPINAL MALFORMATIONS STUDY

The CSM Study was designed to identify possible CSM cases, on the basis of interview reports, and to verify them by using birth records. No attempt was made to verify negative responses (i.e., children with no reported CSM) among live births because these defects are very rare, occurring at a rate of only 1.4 to 2.5 per 1,000 total births (Birth Defects and Genetic Diseases Branch, 1987a; 1987b). The study was undertaken with the assumption that the rate of false negatives would be low in both cohorts. We tried to identify all CSM cases by focusing on those children most likely to have one of these defects. The total number of verified CSMs in the Vietnam cohort is similar to the number that would be expected in the interview population on the basis of rates of these defects from two U.S. birth defect surveillance systems (Birth Defects and Genetic Diseases Branch, 1987a; 1987b) (Table 39). In contrast, the number of records-based CSM cases among children of non-Vietnam veterans is much lower than would be expected. This suggests a deficit of ascertained CSMs among children of non-Vietnam veterans, rather than an excess among children of Vietnam veterans. These data may reflect true differences between the cohorts, or may be due to differences in the opportunity to identify and verify probable CSM cases. There is evidence to suggest the latter explanation, since selection of participants for this study was based on fathers' interview reports and, hence, was subject to differential reporting in the two cohorts. Also, there were appreciable differences in participation rates in this study.

Table 39. Observed Numbers of Cerebrospinal Malformations and Expected Numbers Based on Two U.S. Surveillance Systems

Cerebrospinal Malformation	Vietnam		Non-Vietnam	
	Observed	Expected[a]	Observed	Expected[a]
Anencephaly	10	5.0-9.0	7	4.6-3.4
Spina bifida	9	7.2-12.2	2	6.7-11.4
Hydrocephalus	7	6.1-11.2	3	5.7-10.5
Total	26	18.3-32.4	12	17.0-30.3

[a] Expected numbers are based on total rates from the nationwide Birth Defects Monitoring Program (lower estimates) and race-specific rates from the Metropolitan Atlanta Congenital Defects Program (upper estimates).

The overall participation rate in this study met the goal established at the onset (75%). However, there were serious differences between the cohorts; Vietnam veterans were more likely to participate than non-Vietnam veterans. This creates two opportunities for bias: (1) the participating cohorts may not be equally representative of their respective eligible populations; and (2) since the purpose of this study is to validate suspected positives, the potential for cases to be missed is greater among non-Vietnam veterans. The distribution of covariates among participants in this study shows some differences between children of Vietnam and non-Vietnam veterans with regard to characteristics of their fathers. Compared with Vietnam veterans, non-Vietnam veterans were better educated, scored higher on the GT test, were more likely to be married, were older when their child was born, and had lower alcohol use.

Another concern is the potential for differential reporting (information bias) in this study. The selection of stillbirths was independent of interview reports of birth defects (all stillbirths were included). It was, of course, dependent on interview reports of stillbirths. While differential reporting of stillbirths cannot be entirely ruled out, there is no evidence to suggest it since stillbirths were reported in the two cohorts with equal frequency. In the stillbirth series, the prevalence of verified CSM cases was very similar in the two cohorts. In contrast, the selection of live births was based on fathers' reports of CSMs and, hence, may have been subject to differential reporting. The difference between the two cohorts in numbers of verified CSM cases is due entirely to differences in the live-birth series. This may indicate that live-born probable CSM cases were underreported by non-Vietnam veterans during the interview and, consequently, had no opportunity to be verified using birth records.

6.4 OTHER RELEVANT STUDIES

The results of the General Birth Defects Study can be compared with the results of three relatively large scale epidemiologic studies of Vietnam service and reproductive outcomes of male veterans. The first study, published in 1983 by the Australian government (Donovan et al., 1983), was a large case-control study of children born between 1966 and 1979 with congenital malformations. The purpose of the study was to examine the risk of birth defects associated with Vietnam service in general; no index of exposure to Agent Orange was developed. The study showed no difference in the odds of Vietnam service among case and control fathers (OR = 1.02). When about 100 specific defect groups were examined, most had ORs of less than 1.5. The authors concluded that Vietnam service "has not been associated with any important increase in the risk of birth defects in children of veterans."

In the second case-control study (Erickson et al., 1984a; 1984b), cases included all live-born and stillborn infants with major structural defects diagnosed in the first year of life and ascertained during the years 1968-1980 in a population-based registry. Information about paternal military service was obtained through interviews with mothers and fathers. Exposure to Agent Orange was assessed using perceptions of the veterans' own exposure and an exposure opportunity index based on location in Vietnam, period of service, and occupational duties. The OR for all types of defects was 0.97. With few exceptions, the same pattern was found when 95 defect groups were individually examined and when the exposure opportunity index was assessed. The exceptions included a higher risk for neoplasms, cleft lip with or without cleft palate, and spina bifida (but not anencephaly) for Vietnam veteran fathers who received higher scores for the exposure opportunity index. Whether the few differences seen for specific defect groups were due to chance or represent real differences was not clear. In recent laboratory studies of serum dioxin (2,3,7,8-tetrachlorodibenzo-para-dioxin) levels in Vietnam and non-Vietnam veterans (CDC, in press), investigators found no correlation between military records-based exposure estimates or self-reported exposure and serum dioxin levels. These findings cast doubt on the ability of previously developed exposure indices to accurately measure true exposure to Agent Orange.

In a third study, a cohort follow-up study, about 1,200 Air Force personnel who conducted the defoliation missions in Vietnam were compared with a cohort of cargo-mission personnel who flew to Vietnam but did not participate in spraying operations (Lathrop et al., 1984). Reproductive outcomes were obtained mainly via spouse interviews. Among children conceived after duty in South East Asia, there was a significant (p=0.05) excess of total reported birth defects among defoliation personnel. This reported excess prompted the collection of birth and medical records for all children, an effort that is currently ongoing.

Results of both the Australian and the CDC case-control studies seem to establish, with adequate statistical power, that men who served in Vietnam are, in general, not at increased risk of fathering babies with congenital malformations. However, even in these large scale studies, it was not possible to adequately address whether these men are at increased risk of fathering babies with specific rare malformations.

In addition to the above studies, several studies have been conducted in Vietnam and recently reviewed by Constable and Hatch (1985). Some of these studies dealt with maternal exposures and unspecified widespread spraying in which it is difficult to separate paternal from maternal herbicide exposures. Another type of study compared reproductive outcomes of women living in unsprayed North Vietnam whose husbands served in South Vietnam with women whose husbands remained in North Vietnam. While several of these studies showed a positive association between congenital malformations and fathers' service in South Vietnam, Constable and Hatch are careful to note the major methodological problems and limitations of these studies in the following areas: bias in selection and reporting, ascertainment of reproductive outcomes (particularly congenital malformations), definition of exposure, small sample sizes, sources of data, and control of potentially confounding variables. Because of the many limitations and potential biases, the usefulness and relevance of the study results are limited.

6.5 CONCLUSIONS

In summary, in the telephone interview, Vietnam veterans reported more total and individual birth defects in their children than did non-Vietnam veterans. However, a study of total birth defects documented on hospital birth records showed that, for birth defects evident at birth, children of Vietnam veterans were not at increased risk. Results of a second study of potential cerebrospinal malformation cases were equivocal. While more CSM cases were verified among children of Vietnam veterans than non-Vietnam veterans, there is evidence to suggest that these results may have been influenced by both differential reporting and differential participation in the two cohorts. Our results for total birth defects are consistent with the findings of three epidemiologic studies conducted since 198 on the relationship of Vietnam service and birth defects in children of male veterans.

REFERENCES

Anderson DA, Aitkin M. Variance component models with binary response. J R Stat Soc B 1985;47:203 0.

Birth Defects and Genetic Diseases Branch. The Birth Defects Monitoring Program, January 1970-June 1987, data tapes. Atlanta: Centers for Disease Control, 1987a.

Birth Defects and Genetic Diseases Branch. The Metropolitan Atlanta Congenital Defects Program, 1968-1985, data tapes. Atlanta: Centers for Disease Control, 1987b.

Bogen G. Symptoms in Vietnam veterans exposed to Agent Orange (Letter to the Editor). JAMA 1979;242:2391.

Bonney GE. Regressive logistic models for familial disease and other binary traits. Biometrics 1986;42:311-25.

Boyle CA, Decoufle P, Delaney RJ, et.al. Postservice mortality among Vietnam veterans. Atlanta: Centers for Disease Control, 1987.

Breslow NE, Day NE. Statistical methods in cancer research: the analysis of case-control studies; vol 1. Lyon, France: International Agency for Research on Cancer, 1980.

Centers for Disease Control. Postservice mortality among Vietnam veterans. JAMA 1987;257:790-5.

Centers for Disease Control Veterans Health Studies. Serum 2,3,7,8-tetrachlorodibenzo-para-dioxin levels in U.S. Army Vietnam-era veterans. JAMA (in press).

Connolly M, Liang KY. Conditional logistic regression models for correlated binary data. Biometrics (in press).

Constable JD, Hatch MC. Reproductive effects of herbicide exposure in Vietnam: recent studies by the Vietnamese and others. Teratogenesis Carcinog Mutagen 1985;5:231-50.

Dixon WJ, ed. BMDP statistical software. 1983 printing with additions. Berkeley, California: University of California Press, 1983:330-44.

Donovan JW, Adena MA, Rose G, Batistutta D. Case-control study of congenital anomalies and Vietnam service. Canberra, Australia: Government Publishing Services, 1983.

Dwyer JH, Smith R. Health problems of U.S. military veterans and possible exposure to phenoxy acid herbicides in Vietnam: partial coding and statistical analysis of the Citizen Soldier Health Questionnaire (CSHQ). Final report to the National Toxicology Program of statistical analyses supported by the National Institute of Environmental Health Sciences. December 4, 1981.

Erickson JD, Mulinaire J, McClain PW, et al. Vietnam veterans' risks for fathering babies with birth defects. Atlanta: Centers for Disease Control, 1984a.

Erickson JD, Mulinare J, McClain PW, et al. Vietnam veterans' risks for fathering babies with birth defects. JAMA 1984b;252:903-12.

Flanders WD, Rhodes PH. Large sample confidence limits for regression standardized risks, risk ratios, and risk differences. J Chronic Dis 1987;40:697-704.

Fleiss JL. Statistical methods for rate and proportions. 2nd ed. New York: J Wiley and Sons, 1981:212-36.

Flynt JW, Hay S. International clearinghouse for birth defects monitoring. In: Klingberg MA, Westell JAC, eds. Contributions to epidemiology and biostatistics; vol 1. Basel: Karger, 1979:44-52.

Fox JL. Tentative Agent Orange settlement reached. Science 1984; 224:849-50.

Harrell FE. The LOGIST procedure. In: Joyner SP, ed. SUGI supplemental library user's guide. Cary, North Carolina: SAS Institute Inc., 1983.

Holden C. Agent Orange furor continues to build. Science 1979; 205:770-2.

International clearinghouse for birth defects monitoring systems. 1984 Annual report. Wellington, New Zealand: VR Ward, 1986.

Kelsey JL, Thompson WD, Evans AS. Methods in observational epidemiology. New York: Oxford University Press, 1986:38. (Lilienfeld AM, ed. Monographs in epidemiology and biostatistics; vol 10).

Lathrop GD, Wolfe WH, Albanese RA, Moynahan PM. An epidemiologic investigation of health effects in Air Force personnel following exposure to herbicides. Baseline morbidity study results. San Antonio, Texas: U.S. Air Force School of Aerospace Medicine, 1984.

Liang K, Zeger SL. Longitudinal data analysis using generalized linear models. Biometrika 1986;73:13-22.

McKusick VA. Mendelian inheritance in man: catalogs of autosomal dominant, autosomal recessive and x-linked phenotypes. 7th ed. Baltimore: The Johns Hopkins University Press, 1986.

Rosner B. Multivariate methods in ophthalmology, with applications to other paired-data situations. Biometrics 1984;40:1025-35.

Rothman KJ. Modern epidemiology. Boston: Little, Brown, 1986:299-304.

SAS Institute Inc. SAS user's guide: Statistics, version 5 edition. Cary, North Carolina: SAS Institute Inc., 1985:403-32.

Stellman S, Stellman J. Health problems among 535 Vietnam veterans potentially exposed to toxic herbicides (Abstract). Am J Epidemiol 1980;112:444.

Stiratelli R, Laird N, Ware JH. Random effects models for serial observations with binary responses. Biometrics 1984;40:961-71.

Stram DO, Wei LJ, Ware JH. Analysis of repeated ordered categorical outcomes with possibly missing observations and time-dependent covariates. J Am Stat Assoc (in press).

Wilcosky TC, Chambless LE. A comparison of direct adjustment and regression adjustment of epidemiologic measures. J Chronic Dis 1985;38:849-56.

World Health Organization. Manual of the international statistical classification of diseases, injuries, and causes of death; vol 1 and 2. Geneva: World Health Organization, 1977.

Zeger SL, Liang K. Longitudinal data analysis for discrete and continuous outcomes. Biometrics 1986;42:121-30.

Zeger SL, Liang K, Albert PS. Model for longitudinal data: a generalized estimating equation approach. Baltimore: Department of Biostatistics, Johns Hopkins University, 1987.

APPENDIX A

VES Telephone Questionnaire, Section B

SECTION B. MARITAL AND REPRODUCTIVE HISTORY

* B-01. Now I would like to ask about your marital status. Are you currently married, widowed, separated, divorced, or have you never been married?

    1 = MARRIED
    2 = WIDOWED
    3 = SEPARATED
    4 = DIVORCED
    5 = NEVER MARRIED → SKIP TO B-03.

B-02. How many times have you been married?

    ENTER NUMBER OF TIMES. (RANGE = 1-10.)

---

* B-03. Now I have some questions about the children, if any, that you have fathered. Please include all babies who were born alive, as well as any babies who may have been stillborn or who died shortly after birth or during childhood. Do not, however, count miscarriages, abortions, or any pregnancy that did not result in a liveborn or stillborn baby. Altogether, how many children have you fathered?

    ENTER NUMBER. IF NONE, ENTER "88" AND SKIP TO B-17. (RANGE = 1-20.)

IF B-03 ≥ 1 [CHILD 1]

B-04A01. (Let's begin with your first-born child.) Was your (first) child a boy or girl?

    1 = BOY
    2 = GIRL

B-04B01. In what month and year was [he/she] born?
    ENTER MONTH (RANGE 1-12) AND LAST TWO DIGITS OF YEAR.

    _____ MONTH   _____ YEAR   (EDIT 3.)

B-04C01. Was [he/she] a live birth or a stillbirth?

    1 = LIVEBIRTH
    2 = STILLBIRTH → SKIP TO NEXT CHILD IF B-03 > 1. OTHERWISE GO TO B-05A. CATI SUPPLIES "STILLBORN, YEAR OF BIRTH" IN ROSTER.

B-04D01. What did you name [him/her]?
    ENTER FIRST NAME. CATI SUPPLIES NAME IN ROSTER. (LIMIT OF 15 CHARACTERS.)

IF B-03 ≧ 2 CHILD 2

B-04A02. Was your second child a boy or girl?

        1 = BOY
        2 = GIRL

B-04B02. In what month and year was [he/she] born?
        ENTER MONTH (RANGE 1-12) AND LAST TWO DIGITS OF YEAR.

        _____ MONTH   _____ YEAR   (EDIT 3.)

B-04C02. Was [he/she] a live birth or a stillbirth?

        1 = LIVEBIRTH
        2 = STILLBIRTH → SKIP TO NEXT CHILD IF B-03 > 2. OTHERWISE,
                              GO GO B-05A. CATI SUPPLIES "STILLBORN,
                              YEAR OF BIRTH" IN ROSTER.

B-04D02. What did you name [him/her]?

        ENTER FIRST NAME. CATI SUPPLIES NAME IN ROSTER. (LIMIT OF 15
        CHARACTERS.)

        _____

IF B-03 ≧ 3 CHILD 3

B-04A03. Was your third child a boy or girl?

        1 = BOY
        2 = GIRL

B-04B03. In what month and year was [he/she] born?
        ENTER MONTH (RANGE 1-12) AND LAST TWO DIGITS OF YEAR.

        _____ MONTH   _____ YEAR   (EDIT 3.)

B-04C03. Was [he/she] a live birth or a stillbirth?

        1 = LIVEBIRTH
        2 = STILLBIRTH → SKIP TO NEXT CHILD IF B-03 >3. OTHERWISE,
                              GO TO B-05A. CATI SUPPLIES "STILLBORN,
                              YEAR OF BIRTH" IN ROSTER.

B-04D03. What did you name [him/her]?

        ENTER FIRST NAME. CATI SUPPLIES NAME IN ROSTER. (LIMIT OF 15
        CHARACTERS.)

        _____

IF B-03 ≧ 4 [CHILD 4]

B-04A04.   Was your fourth child a boy or girl?

          1 = BOY
          2 = GIRL

B-04B04.   In what month and year was [he/she] born?
           ENTER MONTH (RANGE 1-12) AND LAST TWO DIGITS OF YEAR.

          _____ MONTH   _____ YEAR   (EDIT 3.)

B-04C04.   Was [he/she] a live birth or a stillbirth?

          1 = LIVEBIRTH
          2 = STILLBIRTH → SKIP TO NEXT CHILD IF B-03 > 4. OTHERWISE,
                             GO TO B-05A. CATI SUPPLIES "STILLBORN,
                             YEAR OF BIRTH" IN ROSTER.

B-04D04.   What did you name [him/her]?

           ENTER FIRST NAME. CATI SUPPLIES NAME IN ROSTER. (LIMIT OF 15
           CHARACTERS.)

           _____

IF B-03 ≧ 5 [CHILD 5]

B-04A05.   Was your fifth child a boy or girl?

          1 = BOY
          2 = GIRL

B-04B05.   In what month and year was [he/she] born?
           ENTER MONTH (RANGE 1-12) AND LAST TWO DIGITS OF YEAR.

          _____ MONTH   _____ YEAR   (EDIT 3.)

B-04C05.   Was [he/she] a live birth or a stillbirth?

          1 = LIVEBIRTH
          2 = STILLBIRTH → SKIP TO NEXT CHILD IF B-03 > 5. OTHERWISE,
                             GO TO B-05A. CATI SUPPLIES "STILLBORN,
                             YEAR OF BIRTH" IN ROSTER.

B-04D05.   What did you name [him/her]?

           ENTER FIRST NAME. CATI SUPPLIES NAME IN ROSTER. (LIMIT OF 15
           CHARACTERS.)

           _____

IF B-03 ≧ 6 | CHILD 6 |

B-04A06. Was your sixth child a boy or girl?

> 1 = BOY
> 2 = GIRL

B-04B06. In what month and year was [he/she] born?
> ENTER MONTH (RANGE 1-12) AND LAST TWO DIGITS OF YEAR.

> _____ MONTH   _____ YEAR   (EDIT 3.)

B-04C06. Was [he/she] a live birth or a stillbirth?

> 1 = LIVEBIRTH
> 2 = STILLBIRTH → SKIP TO NEXT CHILD IF B-03 > 6. OTHERWISE,
> GO TO B-05A. CATI SUPPLIES "STILLBORN,
> YEAR OF BIRTH" IN ROSTER.

B-04D06. What did you name [him/her]?

> ENTER FIRST NAME. CATI SUPPLIES NAME IN ROSTER. (LIMIT OF 15
> CHARACTERS.)

> _____

IF B-03 ≧ 7 | CHILD 7 |

B-04A07. Was your seventh child a boy or girl?

> 1 = BOY
> 2 = GIRL

B-04B07. In what month and year was [he/she] born?
> ENTER MONTH (RANGE 1-12) AND LAST TWO DIGITS OF YEAR.

> _____ MONTH   _____ YEAR   (EDIT 3.)

B-04C07. Was [he/she] a live birth or a stillbirth?

> 1 = LIVEBIRTH
> 2 = STILLBIRTH → SKIP TO NEXT CHILD IF B-03 > 7. OTHERWISE,
> GO TO B-05A. CATI SUPPLIES "STILLBORN,
> YEAR OF BIRTH" IN ROSTER.

B-04D07. What did you name [him/her]?

> ENTER FIRST NAME. CATI SUPPLIES NAME IN ROSTER. (LIMIT OF 15
> CHARACTERS.)

> _____

IF B-03 ≧ 8 | CHILD 8 |

B-04A08. Was your eighth child a boy or girl?

       1 = BOY
       2 = GIRL

B-04B08. In what month and year was [he/she] born?
       ENTER MONTH (RANGE 1-12) AND LAST TWO DIGITS OF YEAR.

    _____ MONTH   _____ YEAR   (EDIT 3.)

B-04C08. Was [he/she] a live birth or a stillbirth?

       1 = LIVEBIRTH
       2 = STILLBIRTH → SKIP TO NEXT CHILD IF B-03 > 8. OTHERWISE,
                      GO TO B-05A. CATI SUPPLIES "STILLBORN,
                      YEAR OF BIRTH" IN ROSTER.

B-04D08. What did you name [him/her]?

       ENTER FIRST NAME. CATI SUPPLIES NAME IN ROSTER. (LIMIT OF 15
       CHARACTERS.)

    _____

IF B-03 ≧ 9 | CHILD 9 |

B-04A09. Was your ninth child a boy or girl?

       1 = BOY
       2 = GIRL

B-04B09. In what month and year was [he/she] born?
       ENTER MONTH (RANGE 1-12) AND LAST TWO DIGITS OF YEAR.

    _____ MONTH   _____ YEAR   (EDIT 3.)

B-04C09. Was [he/she] a live birth or a stillbirth?

       1 = LIVEBIRTH
       2 = STILLBIRTH → SKIP TO NEXT CHILD IF B-03 > 9. OTHERWISE,
                      GO TO B-05A. CATI SUPPLIES "STILLBORN,
                      YEAR OF BIRTH" IN ROSTER.

B-04D09. What did you name [him/her]?

       ENTER FIRST NAME. CATI SUPPLIES NAME IN ROSTER. (LIMIT OF 15
       CHARACTERS.)

    _____

IF B-03 ≧ 10 | CHILD 10 |

B-04A10. Was your tenth child a boy or girl?

          1 = BOY
          2 = GIRL

B-04B10. In what month and year was [he/she] born?
          ENTER MONTH (RANGE 1-12) AND LAST TWO DIGITS OF YEAR.

          _____ MONTH   _____ YEAR   (EDIT 3.)

B-04C10. Was [he/she] a live birth or a stillbirth?

          1 = LIVEBIRTH
          2 = STILLBIRTH → SKIP TO NEXT CHILD IF B-03 > 10. OTHEKVISE,
                             GO TO B-05A. CATI SUPPLIES "STILLBORN
                             YEAR OF BIRTH" IN ROSTER.

B-04D10. What did you name [him/her]?

          ENTER FIRST NAME. CATI SUPPLIES NAME IN ROSTER. (LIMIT OF 15
          CHARACTERS.)

          _____

IF B-03 ≧ 11 | CHILD 11 |

B-04A11. Was your eleventh child a boy or girl?

          1 = BOY
          2 = GIRL

B-04B11. In what month and year was [he/she] born?
          ENTER MONTH (RANGE 1-12) AND LAST TWO DIGITS OF YEAR.

          _____ MONTH   _____ YEAR   (EDIT 3.)

B-04C11. Was [he/she] a live birth or a stillbirth?

          1 = LIVEBIRTH
          2 = STILLBIRTH → SKIP TO NEXT CHILD IF B-03 > 11. OTHERWISE,
                             GO TO B-05A. CATI SUPPLIES "STILLBORN,
                             YEAR OF BIRTH" IN ROSTER.

B-04D11. What did you name [him/her]?

          ENTER FIRST NAME. CATI SUPPLIES NAME IN ROSTER. (LIMIT OF 15
          CHARACTERS.)

          _____

IF B-03 ≥ 12 | CHILD 12 |

B-04A12. Was your twelfth child a boy or girl?

        1 = BOY
        2 = GIRL

B-04B12. In what month and year was [he/she] born?
        ENTER MONTH (RANGE 1-12) AND LAST TWO DIGITS OF YEAR.

    _____ MONTH   _____ YEAR   (EDIT 3.)

B-04C12. Was [he/she] a live birth or a stillbirth?

        1 = LIVEBIRTH
        2 = STILLBIRTH → SKIP TO NEXT CHILD IF B-03 > 12. OTHERWISE,
                             GO TO B-05A. CATI SUPPLIES "STILLBORN,
                             YEAR OF BIRTH" IN ROSTER.

B-04D12. What did you name [him/her]?

    ENTER FIRST NAME. CATI SUPPLIES NAME IN ROSTER. (LIMIT OF 15
    CHARACTERS.)

    _____

IF B-03 ≥ 13 | CHILD 13 |

B-04A13. Was your thirteenth child a boy or girl?

        1 = BOY
        2 = GIRL

B-04B13. In what month and year was [he/she] born?
        ENTER MONTH (RANGE 1-12) AND LAST TWO DIGITS OF YEAR.

    _____ MONTH   _____ YEAR   (EDIT 3.)

B-04C13. Was [he/she] a live birth or a stillbirth?

        1 = LIVEBIRTH
        2 = STILLBIRTH → SKIP TO NEXT CHILD IF B-03 > 13. OTHERWISE,
                             GO TO B-05A. CATI SUPPLIES "STILLBORN,
                             YEAR OF BIRTH" IN ROSTER.

B-04D13. What did you name [him/her]?

    ENTER FIRST NAME. CATI SUPPLIES NAME IN ROSTER. (LIMIT OF 15
    CHARACTERS.)

    _____

IF B-03 ≥ 14 [CHILD 14]

B-04A14. Was your fourteenth child a boy or girl?

        1 = BOY
        2 = GIRL

B-04B14. In what month and year was [he/she] born?
        ENTER MONTH (RANGE 1-12) AND LAST TWO DIGITS OF YEAR.

_____ MONTH   _____ YEAR   (EDIT 3.)

B-04C14. Was [he/she] a live birth or a stillbirth?

        1 = LIVEBIRTH
        2 = STILLBIRTH → SKIP TO NEXT CHILD IF B-03 > 14. OTHERWISE,
                                GO TO B-05A. CATI SUPPLIES "STILLBORN,
                                YEAR OF BIRTH" IN ROSTER.

B-04D14. What did you name [him/her]?

        ENTER FIRST NAME. CATI SUPPLIES NAME IN ROSTER. (LIMIT OF 15
        CHARACTERS.)

_____

IF B-03 ≥ 15 [CHILD 15]

B-04A15. Was your fifteenth child a boy or girl?

        1 = BOY
        2 = GIRL

B-04B15. In what month and year was [he/she] born?
        ENTER MONTH (RANGE 1-12) AND LAST TWO DIGITS OF YEAR.

_____ MONTH   _____ YEAR   (EDIT 3.)

B-04C15. Was [he/she] a live birth or a stillbirth?

        1 = LIVEBIRTH
        2 = STILLBIRTH → SKIP TO NEXT CHILD IF B-03 > 15. OTHERWISE,
                                GO TO B-05A. CATI SUPPLIES "STILLBORN,
                                YEAR OF BIRTH" IN ROSTER.

B-04D15. What did you name [him/her]?

        ENTER FIRST NAME. CATI SUPPLIES NAME IN ROSTER. (LIMIT OF 15
        CHARACTERS.)

_____

IF B-03 ≧ 16 [CHILD 16]

B-04A16. Was your sixteenth child a boy or girl?

        1 = BOY
        2 = GIRL

B-04B16. In what month and year was [he/she] born?
        ENTER MONTH (RANGE 1-12) AND LAST TWO DIGITS OF YEAR.

      _____ MONTH   _____ YEAR   (EDIT 3.)

B-04C16. Was [he/she] a live birth or a stillbirth?

        1 = LIVEBIRTH
        2 = STILLBIRTH → SKIP TO NEXT CHILD IF B-03 > 16. OTHERWISE,
                              GO TO B-05A. CATI SUPPLIES "STILLBORN,
                              YEAR OF BIRTH" IN ROSTER.

B-04D16. What did you name [him/her]?

        ENTER FIRST NAME. CATI SUPPLIES NAME IN ROSTER. (LIMIT OF 15
        CHARACTERS.)

        _____

IF B-03 ≧ 17 [CHILD 17]

B-04A17. Was your seventeenth child a boy or girl?

        1 = BOY
        2 = GIRL

B-04B17. In what month and year was [he/she] born?
        ENTER MONTH (RANGE 1-12) AND LAST TWO DIGITS OF YEAR.

      _____ MONTH   _____ YEAR   (EDIT 3.)

B-04C17. Was [he/she] a live birth or a stillbirth?

        1 = LIVEBIRTH
        2 = STILLBIRTH → SKIP TO NEXT CHILD IF B-03 > 17. OTHERWISE,
                              GO TO B-05A. CATI SUPPLIES "STILLBORN,
                              YEAR OF BIRTH" IN ROSTER.

B-04D17. What did you name [him/her]?

        ENTER FIRST NAME. CATI SUPPLIES NAME IN ROSTER. (LIMIT OF 15
        CHARACTERS.)

        _____

IF B-03 ≥ 18 [CHILD 18]

B-04A18. Was your eighteenth child a boy or girl?

       1 = BOY
       2 = GIRL

B-04B18. In what month and year was [he/she] born?
       ENTER MONTH (RANGE 1-12) AND LAST TWO DIGITS OF YEAR.

    _____ MONTH   _____ YEAR   (EDIT 3.)

B-04C18. Was [he/she] a live birth or a stillbirth?

       1 = LIVEBIRTH
       2 = STILLBIRTH → SKIP TO NEXT CHILD IF B-03 > 18. OTHERWISE,
                          GO TO B-05A. CATI SUPPLIES "STILLBORN,
                          YEAR OF BIRTH" IN ROSTER.

B-04D18. What did you name [him/her]?

       ENTER FIRST NAME. CATI SUPPLIES NAME IN ROSTER. (LIMIT OF 15
       CHARACTERS.)

       _____

IF B-03 ≥ 19 [CHILD 19]

B-04A19. Was your nineteenth child a boy or girl?

       1 = BOY
       2 = GIRL

B-04B19. In what month and year was [he/she] born?
       ENTER MONTH (RANGE 1-12) AND LAST TWO DIGITS OF YEAR.

    _____ MONTH   _____ YEAR   (EDIT 3.)

B-04C19. Was [he/she] a live birth or a stillbirth?

       1 = LIVEBIRTH
       2 = STILLBIRTH → SKIP TO NEXT CHILD IF B-03 > 19. OTHERWISE,
                          GO TO B-05A. CATI SUPPLIES "STILLBORN,
                          YEAR OF BIRTH" IN ROSTER.

B-04D19. What did you name [him/her]?

       ENTER FIRST NAME. CATI SUPPLIES NAME IN ROSTER. (LIMIT OF 15
       CHARACTERS.)

       _____

IF B-03 ≧ 20 [CHILD 20]

B-04A20. Was your twentieth child a boy or girl?

             1 = BOY
             2 = GIRL

B-04B20. In what month and year was [he/she] born?
             ENTER MONTH (RANGE 1-12) AND LAST TWO DIGITS OF YEAR.

          _____ MONTH   _____ YEAR   (EDIT 3.)

B-04C20. Was [he/she] a live birth or a stillbirth?

             1 = LIVEBIRTH
             2 = STILLBIRTH → SKIP TO B-05A. CATI SUPPLIES
                                "STILLBORN, YEAR OF BIRTH" IN ROSTER.

B-04D20. What did you name [him/her]?

             ENTER FIRST NAME. CATI SUPPLIES NAME IN ROSTER. (LIMIT OF 15
             CHARACTERS.)

             _____

B-05A.   [Was your child/Were any of your children] born with any type of
          birth defect or malformation that was diagnosed by a doctor?

             1 = YES
             2 = NO → SKIP TO B-08A.

          CATI DISPLAYS ROSTER OF ALL CHILDREN (LIVEBORN AND STILLBORN).

             EXAMPLE:
             1 = JOHN, 70
             2 = STILLBORN, 72
             3 = SUZIE, 75

B-06A.   (DON'T ASK IF ONLY ONE CHILD.) Which child was born with a birth
          defect or malformation?
          (IF MORE THAN ONE: Let's begin with the <u>first</u> child who was born
          with a birth defect.)
          ENTER NUMBER THAT CORRESPONDS TO NAME OF (FIRST) CHILD WITH BIRTH
          DEFECT.
                     _____ (RANGE = 1 - MAX. CHILD #.)

[FIRST CHILD WITH BIRTH DEFECT]

B-07A1.   What kind of birth defect or malformation did the doctor say (NAME)
          had--did the doctor give it a medical name?

             (PROBE: What part of the body was affected?)
             (PROBE: What kind of (KEYWORD) was it?)

             ENTER CONDITION NAME (LIMIT OF 40 CHARACTERS)

          _____

B-07B1.   Was [he/she] born with any <u>other</u> birth defect or malformation that
was diagnosed by a doctor?

      1 = YES
      2 = NO → GO TO B-05B IF TWO OR MORE LIVEBORN OR STILLBORN
                   CHILDREN. OTHERWISE, GO TO B-08A.

B-07C1.   What other birth defect or malformation did the doctor say (NAME)
had? (Did the doctor give it a medical name?)

      (PROBE: What part of the body was affected?)
      (PROBE: What kind of (KEYWORD) was it?)

      ENTER CONDITION NAME (LIMIT OF 40 CHARACTERS)

_____

B-05B.   [Was your other child/Were any of your other children] born with any
type of birth defect or malformation that was diagnosed by a doctor?

      1 = YES
      2 = NO → SKIP TO B-08A.

CATI DISPLAYS ROSTER OF ALL CHILDREN (LIVEBORN AND STILLBORN).

B-06B.   Which other child was born with a birth defect or malformation?

      ENTER NUMBER THAT CORRESPONDS TO NAME OF (NEXT) CHILD WITH
      BIRTH DEFECT.

    _____ (RANGE = 1 - MAX. CHILD # AND ≠ CHILD # IN B-06A.)

| SECOND CHILD WITH BIRTH DEFECT |

B-07A2.   What kind of birth defect or malformation did the doctor say (NAME)
had--did the doctor give it a medical name?

      (PROBE: What part of the body was affected?)
      (PROBE: What kind of (KEYWORD) was it?)

      ENTER CONDITION NAME (LIMIT OF 40 CHARACTERS)

_____

B-07B2. Was [he/she] born with any <u>other</u> birth defect or malformation that was diagnosed by a doctor?

        1 = YES
        2 = NO → GO TO B-05C IF THREE OR MORE LIVEBORN OR STILLBORN
                        CHILDREN. OTHERWISE, GO TO B-08A.

B-07C2. What other birth defect or malformation did the doctor say (NAME) had? (Did the doctor give it a medical name?)

        (PROBE: What part of the body was affected?)
        (PROBE: What kind of (KEYWORD) was it?)

        ENTER CONDITION NAME (LIMIT OF 40 CHARACTERS)

        _____

B-05C. [Was your other child/Were any of your other children] born with any type of birth defect or malformation that was diagnosed by a doctor?

        1 = YES
        2 = NO → SKIP TO B-08A.

CATI DISPLAYS ROSTER OF ALL CHILDREN (LIVEBORN AND STILLBORN).

B-06C. Which other child was born with a birth defect or malformation?

        ENTER NUMBER THAT CORRESPONDS TO NAME OF (NEXT) CHILD WITH BIRTH DEFECT.

                (RANGE = 1 - MAX. CHILD # AND ≠ CHILD #s IN B-06A
        _____ AND B-06B.)

╔══════════════════════════════╗
THIRD CHILD WITH BIRTH DEFECT
╚══════════════════════════════╝

B-07A3. What kind of birth defect or malformation did the doctor say (NAME) had--did the doctor give it a medical name?

        (PROBE: What part of the body was affected?)
        (PROBE: What kind of (KEYWORD) was it?)

        ENTER CONDITION NAME (LIMIT OF 40 CHARACTERS)

        _____

B-07B3.   Was [he/she] born with any other birth defect or malformation that
was diagnosed by a doctor?

              1 = YES
              2 = NO → GO TO B-05D IF FOUR OR MORE LIVEBORN OR STILLBORN
                           CHILDREN. OTHERWISE, GO TO B-08A.

B-07C3.   What other birth defect or malformation did the doctor say (NAME)
had? (Did the doctor give it a medical name?)

              (PROBE: What part of the body was affected?)
              (PROBE: What kind of (KEYWORD) was it?)

              ENTER CONDITION NAME (LIMIT OF 40 CHARACTERS)

              _____

B-05D.   [Was your other child/Were any of your other children] born with any
type of birth defect or malformation that was diagnosed by a doctor?

              1 = YES
              2 = NO   → SKIP TO B-08A.

CATI DISPLAYS ROSTER OF ALL CHILDREN (LIVEBORN AND STILLBORN).

B-06D.   Which other child was born with a birth defect or malformation?

              ENTER NUMBER THAT CORRESPONDS TO NAME OF (NEXT) CHILD WITH
              BIRTH DEFECT.

                          (RANGE = 1 - MAX. CHILD # AND ≠ CHILD #s IN B-06A,
              _____   B-06B, AND B-06C.)

┌─────────────────────────────┐
│ FOURTH CHILD WITH BIRTH DEFECT │
└─────────────────────────────┘

B-07A4.   What kind of birth defect or malformation did the doctor say (NAME)
had--did the doctor give it a medical name?

              (PROBE: What part of the body was affected?)
              (PROBE: What kind of (KEYWORD) was it?)

              ENTER CONDITION NAME (LIMIT OF 40 CHARACTERS)

              _____

B-07B4.   Was [he/she] born with any other birth defect or malformation that
           was diagnosed by a doctor?

               1 = YES
               2 = NO → GO TO B-05E IF FIVE OR MORE LIVEBORN OR STILLBORN
                           CHILDREN. OTHERWISE, GO TO B-08A.

B-07C4.   What other birth defect or malformation did the doctor say (NAME)
           had? (Did the doctor give it a medical name?)

               (PROBE: What part of the body was affected?)
               (PROBE: What kind of (KEYWORD) was it?)

               ENTER CONDITION NAME (LIMIT OF 40 CHARACTERS)

               _____

B-05E.   [Was your other child/Were any of your other children] born with any
           type of birth defect or malformation that was diagnosed by a doctor?

               1 = YES
               2 = NO → SKIP TO B-08A.

           CATI DISPLAYS ROSTER OF ALL CHILDREN (LIVEBORN AND STILLBORN).

B-06E.   Which other child was born with a birth defect of malformation?

               ENTER NUMBER THAT CORRESPONDS TO NAME OF (NEXT) CHILD WITH
               BIRTH DEFECT.

                          (RANGE = 1 - MAX. CHILD # AND ≠ CHILD #s IN B-06A,
               _____ B-06B, B-06C, AND B-06D.)

┌─────────────────────────────┐
│ FIFTH CHILD WITH BIRTH DEFECT │
└─────────────────────────────┘

B-07A5.   What kind of birth defect or malformation did the doctor say (NAME)
           had--did the doctor give it a medical name?

               (PROBE: What part of the body was affected?)
               (PROBE: What kind of (KEYWORD) was it?)

               ENTER CONDITION NAME (LIMIT OF 40 CHARACTERS)

               _____

B-07B5.   Was [he/she] born with any other birth defect or malformatior. that
          was diagnosed by a doctor?

                    1 = YES
                    2 = NO   →   GO TO B-05F IF SIX OR MORE LIVEBORN OR STILLBOI:J
                                 CHILDREN. OTHERWISE, GO TO B-08A.

B-07C5.   What other birth defect or malformation did the doctor say :1AME)
          had? (Did the doctor give it a medical name?)

                    (PROBE: What part of the body was affected?)
                    (PROBE: What kind of (KEYWORD) was it?)

                    ENTER CONDITION NAME (LIMIT OF 40 CHARACTERS)

          _____ ‑ ____

B-05F.   [Was your other child/Were any of your other children] born wi:n any
          type of birth defect or malformation that was diagnosed by a do:tor?

                    1 = YES
                    2 = NO   →   SKIP TO B-08A.

          CATI DISPLAYS ROSTER OF ALL CHILDREN (LIVEBORN AND STILL3JRN).

B-06F.   Which other child was born with a birth defect or malformition?

                    ENTER NUMBER THAT CORRESPONDS TO NAME OF (NEXT) CHILL WITH
                    BIRTH DEFECT.

                              (RANGE = 1 - MAX. CHILD # AND ≠ CHILD #s IN B·06A,
                    _____   B-06B, B-06C, B-06D, AND B-06E.)

┌─────────────────────────────┐
│ SIXTH CHILD WITH BIRTH DEFECT │
└─────────────────────────────┘

B-07A6.   What kind of birth defect or malformation did the doctor say :NAME)
          had--did the doctor give it a medical name?

                    (PROBE: What part of the body was affected?)
                    (PROBE: What kind of (KEYWORD) was it?)

                    ENTER CONDITION NAME (LIMIT OF 40 CHARACTERS)

          _____ ‑ ____

B-07B6.   Was [he/she] born with any <u>other</u> birth defect or malformation that was diagnosed by a doctor?

        1 = YES
        2 = NO → GO TO B-08A.

B-07C6.   What other birth defect or malformation did the doctor say (NAME) had? (Did the doctor give it a medical name?)

        (PROBE: What part of the body was affected?)
        (PROBE: What kind of (KEYWORD) was it?)

        ENTER CONDITION NAME (LIMIT OF 40 CHARACTERS)

_____

┌───┐
│ IF ALL CHILDREN STILLBORN, SKIP TO B-17. │
└───┘

B-08A.   Children sometimes develop major health problems or impairments during their first five years. These problems are more serious than normal childhood diseases such as measles, chickenpox, colds or flu, and earaches.
Not counting normal childhood diseases, injuries, or poisonings, did (any of) your child(ren) have any serious health problem or impairment that was diagnosed by a doctor during the first five years of life? (Do not include the birth defect(s) you've already told me about.)

        1 = YES
        2 = NO → SKIP TO B-11A.

CATI DISPLAYS ROSTER OF ALL LIVEBORN AND STILLBORN CHILDREN

B-09A.   (DON'T ASK IF ONLY ONE CHILD.) Which child(ren) had a serious health problem or impairment that was diagnosed during the first five years of life?
(IF MORE THAN ONE: Let's begin with the <u>oldest</u> child who had a serious health problem.)
ENTER NUMBER THAT CORRESPONDS TO NAME OF (FIRST) CHILD WITH PROBLEM.

      _____ (RANGE = VALUES OF CHILD #s FOR LIVEBORN CHILDREN.)