The Third National Health and Nutrition Examination Survey (NHANES III), 1988-94, Series 11, No. 11A (Knee Osteoarthritis X-ray Data and Documentation) Data Release.

The National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention (CDC) collects, analyzes, and disseminates data on the health status of U.S. residents. The results of surveys, analyses, and studies are made known through a number of data release mechanisms including publications, mainframe computer data files, CD-ROMs (Search and Retrieval Software, and the Internet.

The National Health and Nutrition Examination Survey (NHANES) is a periodic survey conducted by NCHS. The third National Health and Nutrition Examination Survey (NHANES III), conducted from 1988 through 1994, was the seventh in a series of these surveys based on a complex, multi-stage sample plan. It was designed to provide national estimates of the health and nutritional status of the United States' civilian, noninstitutionalized population aged two months and older.

This data release, Series 11 No. 11A, contains the NHANES III knee osteoarthritis X-ray data file and documentation. This data release does not replace the previous NHANES III data releases. The released data is in flat text format. A SAS program is provided to read the flat data. The user is advised to have someone who knows SAS data step to adapt the provided SAS program to his or her specific SAS environment.

Background information on the procedures, survey components, questionnaires, examination and laboratory methods, and statistical analysis guidelines is available on the NHANES III Reference Manuals and Reports (CD-ROM). All data users are strongly encouraged to review these reference materials and reports before analyzing NHANES III data.

Guidelines for Data Users

o   NHANES III survey design and demographic variables are found on the
     Household Adult Data File, Household Youth Data File, the Laboratory
     Data File and the Examination Data File. In preparing a data set
     for analysis, other data files should be merged with either or both
     of the Adult Household Data File or the Youth Household Data File
     to obtain many important analytic variables.

o   All of the NHANES III public use data files are linked with the common
     survey participant identification number (SEQN). Merging information
     from multiple NHANES III data files using this variable ensures that
     the appropriate information for each survey participant is linked
     correctly.

o   NHANES III public use data files do not have the same number of records
     on each file. The Household Questionnaire Files (divided into two files,
     Adult and Youth) contain more records than the Examination Data File
     because not everyone who was interviewed completed the examination. The
     Laboratory Data File contains data only for persons aged one year and
     older. The Individual Foods Data File based on the dietary recall, the
     Prescription Medication Data File, and The Vitamin and Minerals Data File

all have multiple records for each person rather than the one record per
sample person contained in the other data files.

o   For each data file, SAS program code with standard variable names and
        labels is provided as separate text files on the CD-ROM that contains the
        data files. This SAS program code can be used to create a SAS data set
        from the data file.

o   Modifications were made to items in the questionnaires, laboratory, and
        examination components over the course of the survey; as a result, data
        may not be available for certain variables for the full six years. In
        addition, variables may differ by phase since some changes were
        implemented between phases. Users are encouraged to read the Notes
        sections of the file documentation carefully for information about
        changes.

o   Extremely high and low values have been verified whenever possible, and
        numerous consistency checks have been performed. Nonetheless, users
        should examine the range and frequency of values before analyzing data.

o   Some data were not ready for release at the time of this publication
        due to continued processing of the data or analysis of laboratory
        specimens. A listing of those data are available in the general
        information section of each data file.

o   Confidential and administrative data are not available or released to the
        public. Additionally, some variables have been recoded to protect the
        confidentiality of the survey participants. For example, all age-related
        variables were recoded to 90+ years for persons who were 90 years of age
        or older.

o   Some variable names may differ from those used in the Phase 1
        NHANES III Provisional Data Release and some variables included in the
        Phase 1 provisional release may not appear on these files. Do not use
        the Phase 1 provisional release; use the current (six-year) release.

o   Although the data files have been edited carefully, it is possible that
        errors may still exist. Please notify NCHS staff (301-458-4636) of any
        suspected errors in the data file or the documentation. Refer to the
        NCHS website at http://www.cdc.gov/nchs/nhanes.htm for updates to these
        data files.

Analytic Considerations

o   NHANES III (1988-94) was designed so that the survey's first three years,
        1988-91, its last three years, 1991-94, and the entire six years were
        national probability samples. Analysts are encouraged to use all six
        years of survey results.

o   Sample weights are available for analyzing NHANES III data. One of the
        following three sample weights will be appropriate for nearly all
        analyses: interviewed sample final weight (WTPFQX6), examined sample
        final weight (WTPFEX6), and mobile examination center (MEC)- and
        home-examined sample final weight (WTPFHX6). Choosing which of these
        sample weights to use in any analysis depends on the variables being
        used. A good rule of thumb is to use "the least common denominator"
        approach. In this approach, the user checks the variables of

interest. The variable that was collected on the smallest number of
persons is the "least common denominator," and the sample weight that
applies to that variable is the appropriate one to use for that
analysis. For more detailed information, see the Analytic and
Reporting Guidelines for NHANES III (U.S. DHHS, 1996).

Referencing or Citing NHANES III Data

o   In publications, please acknowledge NCHS as the original data source.
     For instance, the reference for this Knee Osteoarthritis X-ray
     Data File in this release is: U.S. Department of Health and Human Services
     (DHHS). National Center for Health Statistics. Third National Health and
     Nutrition Examination Survey, 1988-1994, NHANES III Knee osteoarthritis
     X-ray data file (Series 11, No. 11A). Hyattsville, MD: Centers for
     Disease Control and Prevention, 2001.

Problems Using the Data

NHANES III is a wonderfully rich source of data and NCHS encourages you to use
the data for research and analysis. However, the dataset is large and complex
and familiarity with data file manipulation and analysis is required. NCHS does
not have the personnel resources to perform analyses, check results, debug
programs or do literature review for your work. Thorough review of the
extensive documentation on the planning of the survey, analytic guidelines and
individual datasets should resolve most questions. If you still have questions
after careful review of the documentation, please contact the Data Dissemination
Branch at (301)458-4636.

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                  NHANES III Osteoarthritis X-Ray Component Data File Index

        --------------------------------------------------------------------
                                                        Variable
        Description                                     Name       Positions
        --------------------------------------------------------------------


        Respondent identification number ............  SEQN            1-5
        Kellgren-Lawrence score, right knee .........  XRPKLR           6
        Kellgren-Lawrence score, left knee ..........  XRPKLL           7
        Osteophyte - medial femoral, right knee .....  XRPOMFR          8
        Osteophyte - medial femoral, left knee ......  XRPOMFL          9
        Osteophyte - medial tibial, right knee ......  XRPOMTR         10
        Osteophyte - medial tibial, left knee .......  XRPOMTL         11
        Osteophyte - lateral femoral, right knee ....  XRPOLFR         12
        Osteophyte - lateral femoral, left knee .....  XRPOLFL         13
        Osteophyte - lateral tibial, right knee .....  XRPOLTR         14
        Osteophyte - lateral tibial, left knee ......  XRPOLTL         15
        Sclerosis - medial femoral, right knee ......  XRPSMFR         16
        Sclerosis - medial femoral, left knee .......  XRPSMFL         17
        Sclerosis - medial tibial, right knee .......  XRPSMTR         18
        Sclerosis - medial tibial, left knee ........  XRPSMTL         19
        Sclerosis - lateral femoral, right knee .....  XRPSLFR         20
        Sclerosis - lateral femoral, left knee ......  XRPSLFL         21
        Sclerosis - lateral tibial, right knee ......  XRPSLTR         22
        Sclerosis - lateral tibial, left knee .......  XRPSLTL         23
        Chondrocalcinosis - right knee ..............  XRPCHOR         24
        Chondrocalcinosis - left knee ...............  XRPCHOL         25
        Joint replacement - right knee ..............  XRPJRR          26
        Joint replacement - left knee ...............  XRPJRL          27
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                   NHANES III Examination Data File

-----------------------------------------------------------------------
                      EXAMINATION XRAY DATA
-----------------------------------------------------------------------
Positions          Item description
SAS name    Counts    and code                                    Notes
-----------------------------------------------------------------------


    1-5             Respondent identification number
  SEQN      2589    32234-53616


     6              Kellgren-lawrence score, right knee
  XRPKLR    1294    0    Normal
             246    1    Possible osteophyte
             632    2    Definite osteophyte
             166    3    Moderate multiple osteophytes
              54    4    Large osteophytes, severe sclerosis
             163    8    Blank but applicable
              34    9    Unreadable


     7              Kellgren-lawrence score, left knee
  XRPKLL    1271    0    Normal
             302    1    Possible osteophyte
             640    2    Definite osteophyte
             141    3    Moderate multiple osteophytes
              45    4    Large osteophytes, severe sclerosis
             163    8    Blank but applicable
              27    9    Unreadable


     8              Osteophyte - medial femoral, right knee
  XRPOMFR   2009    0    Normal
             254    1    Mild or 1-33% abnormal
              93    2    Moderate or 34-66% abnormal
              36    3    Severe or 67-100% abnormal
             163    8    Blank but applicable
              34    9    Unreadable


     9              Osteophyte - medial femoral, left knee
  XRPOMFL   2060    0    Normal
             223    1    Mild or 1-33% abnormal
              88    2    Moderate or 34-66% abnormal
              28    3    Severe or 67-100% abnormal
             163    8    Blank but applicable
              27    9    Unreadable


     10             Osteophyte - medial tibial, right knee
  XRPOMTR   1721    0    Normal
             588    1    Mild or 1-33% abnormal
              77    2    Moderate or 34-66% abnormal
               6    3    Severe or 67-100% abnormal
             163    8    Blank but applicable
              34    9    Unreadable
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------------------------------------------------------------------------
                          EXAMINATION XRAY DATA
      ------------------------------------------------------------------
      Positions          Item description
      SAS name   Counts     and code                              Notes
      ------------------------------------------------------------------

             11              Osteophyte - medial tibial, left knee
      XRPOMTL     1740    0     Normal
                   583    1     Mild or 1-33% abnormal
                    68    2     Moderate or 34-66% abnormal
                     7    3     Severe or 67-100% abnormal
                   163    8     Blank but applicable
                    28    9     Unreadable

             12              Osteophyte - lateral femoral, right knee
      XRPOLFR     2056    0     Normal
                   247    1     Mild or 1-33% abnormal
                    76    2     Moderate or 34-66% abnormal
                    13    3     Severe or 67-100% abnormal
                   163    8     Blank but applicable
                    34    9     Unreadable

             13              Osteophyte - lateral femoral, left knee
      XRPOLFL     2091    0     Normal
                   229    1     Mild or 1-33% abnormal
                    64    2     Moderate or 34-66% abnormal
                    14    3     Severe or 67-100% abnormal
                   163    8     Blank but applicable
                    28    9     Unreadable

             14              Osteophyte - lateral tibial, right knee
      XRPOLTR     1939    0     Normal
                   366    1     Mild or 1-33% abnormal
                    74    2     Moderate or 34-66% abnormal
                    13    3     Severe or 67-100% abnormal
                   163    8     Blank but applicable
                    34    9     Unreadable

             15              Osteophyte - lateral tibial, left knee
      XRPOLTL     1974    0     Normal
                   361    1     Mild or 1-33% abnormal
                    55    2     Moderate or 34-66% abnormal
                     8    3     Severe or 67-100% abnormal
                   163    8     Blank but applicable
                    28    9     Unreadable

             16              Sclerosis - medial femoral, right knee
      XRPSMFR     2018    0     Normal
                   332    1     Mild or 1-33% abnormal
                    35    2     Moderate or 34-66% abnormal
                     2    3     Severe or 67-100% abnormal
                   163    8     Blank but applicable
                    39    9     Unreadable
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      ------------------------------------------------------------------------
                             EXAMINATION XRAY DATA
      ------------------------------------------------------------------------
       Positions          Item description
       SAS name    Counts    and code                                    Notes
      ------------------------------------------------------------------------


            17                Sclerosis - medial femoral, left knee
       XRPSMFL     2014   0     Normal
                    346   1     Mild or 1-33% abnormal
                     33   2     Moderate or 34-66% abnormal
                      3   3     Severe or 67-100% abnormal
                    163   8     Blank but applicable
                     30   9     Unreadable


            18                Sclerosis - medial tibial, right knee
       XRPSMTR     1951   0     Normal
                    385   1     Mild or 1-33% abnormal
                     47   2     Moderate or 34-66% abnormal
                      4   3     Severe or 67-100% abnormal
                    163   8     Blank but applicable
                     39   9     Unreadable


            19                Sclerosis - medial tibial, left knee
       XRPSMTL     1938   0     Normal
                    403   1     Mild or 1-33% abnormal
                     48   2     Moderate or 34-66% abnormal
                      7   3     Severe or 67-100% abnormal
                    163   8     Blank but applicable
                     30   9     Unreadable


            20                Sclerosis - lateral femoral, right knee
       XRPSLFR     2276   0     Normal
                     94   1     Mild or 1-33% abnormal
                     20   2     Moderate or 34-66% abnormal
                    163   8     Blank but applicable
                     36   9     Unreadable


            21                Sclerosis - lateral femoral, left knee
       XRPSLFL     2311   0     Normal
                     73   1     Mild or 1-33% abnormal
                     13   2     Moderate or 34-66% abnormal
                    163   8     Blank but applicable
                     29   9     Unreadable


            22                Sclerosis - lateral tibial, right knee
       XRPSLTR     2246   0     Normal
                    119   1     Mild or 1-33% abnormal
                     24   2     Moderate or 34-66% abnormal
                      1   3     Severe or 67-100% abnormal
                    163   8     Blank but applicable
                     36   9     Unreadable
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        ----------------------------------------------------------------------
                            EXAMINATION XRAY DATA
        ----------------------------------------------------------------------
        Positions          Item description
        SAS name    Counts     and code                                  Notes
        ----------------------------------------------------------------------


            23               Sclerosis - lateral tibial, left knee
        XRPSLTL     2293   0     Normal
                      88   1     Mild or 1-33% abnormal
                      16   2     Moderate or 34-66% abnormal
                     163   8     Blank but applicable
                      29   9     Unreadable


            24               Chondrocalcinosis - right knee
        XRPCHOR     2207   0     Absent
                     185   1     Present
                     163   8     Blank but applicable
                      34   9     Unreadable


            25               Chondrocalcinosis - left knee
        XRPCHOL     2228   0     Absent
                     168   1     Present
                     163   8     Blank but applicable
                      30   9     Unreadable


            26               Joint replacement - right knee
        XRPJRR      2393   0     Absent
                      29   1     Present
                     163   8     Blank but applicable
                       4   9     Unreadable


            27               Joint replacement - left knee ;
        XRPJRL      2399   0     Absent
                      26   1     Present
                     163   8     Blank but applicable
                       1   9     Unreadable
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NHANES III KNEE OSTEOARTHRITIS X-ray Data Special Notes

This "Special Notes" specific to the Knee Osteoarthritis X-ray Data File is divided into four main sections. The first section, "General Information," provides information about the file contents. The second section, "NHANES III X-ray Component Index," includes a brief description of each variable in the data set, the variable name and the item position. The third section, "NHANES III Examination Data File; Item Descriptions, Codes, Counts, and Notes" provides the variable name, a brief description of the possible values for that variable, a frequency count for each value, notes by variable, and appendices as necessary. "References" are provided in the fourth section.

GENERAL INFORMATION
        The analysis of NHANES III knee osteoarthritis data must be conducted in the context of the key survey design and basic demographic variables. The NHANES III Household Adult Questionnaire Data File (ages 17 years and older) contains demographic data, health indicators, functional health status and other related information collected during household interviews. The NHANES III Household Adult Examination Data File (ages 17 years and older) contains physician's examination of theses joints and other related information. They also contain all survey design variables and sample weights for these age groups.
These files may be linked to the knee osteoarthritis x-ray data file using the unique survey participant (sample person) identifier SEQN.

Scope of Data Release
        Only Phase 2 (1991-1994) knee radiographs were read for osteoarthritis in NHANES III and are contained in this data release. Therefore, when analyzing data for these readings, the MEC Phase 2 sample weight should be used (WTPFEX2). For more information on the use of sample weights in NHANES III data analysis, refer to the NHANES III Analytic and Reporting Guidelines (U.S. DHHS, 1996b). At the time of this data release, hand osteoarthritis x-ray results were not available. NHANES III hand and knee radiographs have also not been read for any other types of arthritis.

Radiograph Collection
        Non-weight bearing anteroposterior knee radiographs (x-rays) were collected on examinees aged 60 years and older at the mobile examination center (MEC). There were no medical, safety or other exclusions in the protocol for this component. All examinees who were able to self transfer to the x-ray table, or who could be assisted in transferring by someone who accompanied them, were eligible. No radiographs were taken on examinees who did not travel to the MEC. There was an overall 93% completion rate for obtaining radiographs from participants who were examined (see table A.8, Analytic and Reporting Guidelines U.S. DHHS, 1996b).   Reasons for incomplete tests or tests not done included: 1. hardware malfunction or lack of supplies; 2. insufficient time available or room not available; 3. examinee refused or uncooperative; 4. examinee unable to physically cooperate. For those examinees, osteoarthritis knee x-ray results were coded as '8 - Blank but applicable'.
        Detailed radiograph collection and processing instructions are discussed in the X-ray Procedures Manual (U.S. DHHS, 1996). The MEC physicians reviewed all x-rays both for technique and for abnormal findings. Abnormal findings were forwarded for an expedited reading by a contract radiologist and triggered a report of findings letter to inform the participant. For quality control purposes, using an observation checklist, the radiology consultant periodically observed a sample of x-rays taken by technicians.   Feedback was

provided on a regular basis to technicians.

Radiographic Atlases, Scoring Systems, Reader Training and Reading Protocols
In order to obtain global and individual radiographic features (IRF) readings for knee OA, the Kellgren-Lawrence (KL) atlas for knee OA (1) and the Osteoarthritis Research Society atlas of individual radiographic features of OA (2) were used, respectively. In addition, presence or absence of chondrocalcinosis and joint replacement were noted. Joint replacement included the presence of arthroplastic orthopedic hardware related to the articular surface. Radiographs were considered unreadable for a feature if there was inadequate coverage of the anatomy, motion, rotation, incorrect positioning, or over- or under-exposure, and coded in the dataset as '9 – unreadable'. Less than two percent of radiographs were unreadable for any feature.
Evidence of disease for the global scores was defined as a Kellgren-Lawrence score of =2, where grade 2 equals the presence of definite osteophytes (with or without possible joint space narrowing, since these are non-weight bearing radiographs). Evidence of disease for IRF (osteophytes and sclerosis) were defined as scores = 1 which represented at least mild (1-33%) abnormality. Evidence of chondrocalcinosis and joint replacement were defined as scores = 1 which represented presence of disease.
Two radiologists were trained in the radiograph scoring methods by an expert musculoskeletal radiologist. The standardized approach for reading the study radiographs included a single reading on all radiographs by one qualified reader. Additionally, all radiographs showing any evidence of disease, plus a random sample of radiographs from 10% of non-affected individuals were read by a second reader. Three sets of quality control (QC) radiographs with an equal representation of normal to advanced disease were selected from the study population by the project coordinator for use in intra- and inter-reader reliability assessment. Kappa statistics were used to assess reader reliability for the presence of disease (KL grade 2-4; osteophytes grade 1-3; and sclerosis grade 1-3) versus non-disease (KL grade 0-1; osteophytes grade 0; and sclerosis grade 0).
Kappas for inter-rater agreement were > 0.71 for the KL scores, > 0.70 for the IRF osteophyte scores, > 0.50 for sclerosis, and > 0.57 for chondrocalcinosis scores. Kappas for intra-rater agreement for the primary reader were > 0.84 for the KL scores, > 0.80 for the IRF osteophyte scores, > 0.68 for sclerosis, and > 0.80 for chondrocalcinosis scores. Kappas for intra-rater agreement for the secondary reader were > 0.82 for the KL scores, > 0.71 for the IRF osteophyte scores, > 0.58 for sclerosis, and > 0.53 for chondrocalcinosis scores.
Once all readings were completed by both readers, consensus readings were conducted on radiographs showing disagreement between the two qualified readers by major differences: at least two grades for KL global scores, or IRF osteophyte or sclerosis scores; or presence or absence of minimal disease: a) between grades 1 and 2 for KL global scores, or b) between grades 0 and 1 for osteophyte or sclerosis IRF scores or chondrocalcinosis. Concensus readings (for at least one radiographic feature) were performed on 35.6% of the x-rays. For all other reading differences for KL, osteophyte and sclerosis scores, reader 1 scores were used as final.

REFERENCES
1.   Atlas of standard radiographs of arthritis. In: The Epidemiology of Chronic Rheumatism. Vol II. Philadelphia, FA Davis Company, 1963.
2.   Altman RD, Hochberg MC, Murphy WA, Jr., Wolfe F, Lequesne M: Radiographic atlas of the hand, hip and knee. Osteoarthritis Cart 1995;3(Suppl A):3-70.