ABSTRACT:
The SAS* System improves the efficient generation of analytical reports particular to the healthcare industry. A major industry-specific program ("CARS**"), in which latest SAS* System releases work in combination with older IBM mainframe products, is discussed.

The methodologies reviewed often require millions of data records to enter in selection, summarization, merging, and reporting processes—therefore, the relative strengths of the SAS* System are compared to COBOL and Data Analyzer*** in benchmark testing.

Healthcare claims are examined to determine the costs associated with such factors as medical procedures, places of service, types of service, providers of service (e.g., physicians and/or hospitals), and more. The goals involve establishing summations, averages, and other simple statistics relating to healthcare claims in a broad health services region.

The SAS* System is shown to be especially advantageous in the CARS** program for summarizing and merging data from different files. For some data selection needs, COBOL is found to be marginally superior, and for some data summarization requirements, Data Analyzer*** is found to be preferable.

INTRODUCTION:
Even though "SAS*" as an acronym, no longer stands for anything, the BCBSM*-developed application, "CARS**," stands for "Claims Analysis Reporting System." It's probably not entirely a coincidence, however, that the three largest users of CARS** are also the three largest producers of U.S.-assembled road vehicles. In all, however, over 80 companies nationwide benefit from the CARS** program and the authors of this paper wish to explain how the SAS* System serves to make the blend of old and new computer technologies in this application increasingly viable.

TEXT:
Healthcare claims analysis has many dimensions. Key jargon includes:


2. Group -- a division of plan coverage, e.g., "the salary group," "the hourly group," etc.

3. Contract -- a participant in a plan, being generally the same as the SSN of a covered individual.

4. TOS -- type of service, e.g., surgery, psychiatry, etc.

5. POS -- place of service, e.g., hospital inpatient, hospital outpatient, other outpatient, office setting, etc.

6. Procedure -- variety of medical service rendered, e.g., tonsillectomy, appendectomy, septo-rhinoplasty, etc.

7. Facility -- medical treatment location: (cont. on next page)
hospital, clinic, housecall, etc.

8. National data -- raw data concerning health care claims by members of companies that have a presence in other area besides Michigan.

9. Local data -- raw data concerning health care claims by members of companies that have a presence only in Michigan.

10. Ancillary -- associated with a medical treatment; may include food service, telephone calls, etc.

Logical by-groups include:

1. Payment dates ("paid dates")
2. Payment dates ("paid dates")
3. (Par)participant plan codes
4. Group numbers
5. Periodicity ("current," or "prior")
6. PPO plan codes
7. Treatment types ("psychotherapy," "surgery," etc.)
8. Place of Service ("POS"- provider's office, birthing center, hospital inpatient, etc.)
9. Facility--hospital, hospice, etc.
10. DRG--("Diagnostic Related Grouping")
11. MDC ("Major Diagnosis Code")

The CARS** Manual:

The introduction to the CARS** documentation begins:

The Claims Analysis Reporting System, CARS**, is an easy-to-use information system. It will allow you to produce a wide variety of reports on the approved and paid claims for Blue Cross and Blue Shield of Michigan's (BCBSM) national accounts.

CARS** in a Financial System:

CARS** keeps track of complex payment obligations. For example:

1. A given employee works in Michigan (the Control Plan is, therefore, BCBSM).
2. Said employee is injured while vacationing in California in January.
3. Said employee enters facility (e.g., a California hospital) in January.
4. Blue Cross of California becomes the "Par Plan," and pays that hospital for the treatment rendered.
5. Blue Cross of California sends the claim to the Control Plan (BCBSM).
6. BCBSM reimburses the Par Plan (Blue Cross of California).
7. The Control Plan sends a statement to the patient's home address in Michigan, specifying the covered and non-covered (if any) treatments.

Programming Goals: Among the benefits which the SAS System enables the CARS program to achieve are:

1. [Improved] access to the claims and membership data over the methods that had been historically available.
2. Easy generation of requests for both pre-formatted and customized reports by non-programmers with little or no knowledge of computer operations.
3. Customer access to summary claims and membership information.
4. Maintainence of a design philosophy that will:
   (1) Build applications based upon the needs of the people and organizations who make use of the information.
   (2) Value end-user input for design specifications and modifications.
   (3) Enable the CARS development staff to respond quickly to dynamic, changing information needs.

Underlying Theme:

The CARS program relies on three data processing concepts:

(continued on next page)
1. **Summations:** the more highly summarized data is before it is read, the faster the computer will generate the requested report.

2. **Disk storage:** the faster the access to the data, the more the responsiveness to user requests. Thirty months of data are kept on disk in the CARS** system, with twelve additional months available on tape. Thus 3 1/2 total years of time series data is available to user of the CARS** program.

3. **Dialog Manager****:** entry of report request parameters via explanatory panels allows ease-of-use by non-programmers.

4. **Ad-hoc online inquiry** is under development.

**How the CARS** program works:

1. **Computer languages used:**
   
   (1) **Dialog Manager****:** provides panel selection options for specifying report requests. Example follows:

   **DIALOG MANAGER**** EXAMPLE:**

   (please see following page)

   (DIALOG MANAGER**** EXAMPLE cont.)

   Dialog Manager**** passes the resulting requests which (which the user has specified in segments of Data Analyzer**** code to:

   (2) **Data Analyzer***:** which, in turn, puts the user-supplied code segments into Data Analyzer*** program lines such as:

   **Data Analyzer*** Code Example

   (please see following page)

   (please see following page)
2. Resulting reports generated by the CARS** system include (cont.):

(above). May be used to identify sources of inappropriate service utilization.

(4) Blue Shield ExAM reports: overviews of professional costs and utilization. Can be used for time series comparisons and peer comparisons.

(5) Blue Shield ExAM-PLUS reports: detailings of service patterns and cost trends which may appear aberrant and give rise to review, confirmation, and/or follow-up.

(6) Other Lines of Business reports: overviews and detailings of Vision, Dental, Hearing, Major Medical, and other BCBSM products. Allows for combination of Blue Cross and Blue Shield data into a single file for simultaneous analysis.

(7) PAR Plan Report Card reports: comparisons of costs and utilization of a given PAR plan with averages from all of the other competing plans. Can compare costs and utilization by diagnosis, TOS, POS, and more.

(8) Prescription Drug reports: identifiers of prescription drug dispensing patterns.

(9) Financial Summary reports: large, multi-year reports of financial trends in medical costs, for easy analysis.

(10) Utility Options: aids to inexperienced users of the CARS** system, using the ISPF**** help facility.

(11) Data Quality reports: frequency counts and total payments summations for
(2. Resulting reports generated by the CARS** system include (cont.):)

comparison with known values from alternative sources, for quality control on reports.

(12) Membership/Demographic Reports: provides supplementary information used to calculate health care plan rates for groups and/or individuals.

(13) Audit listings: provides claim-specific information for selected cases. Can be used as basis for focused review of provider activities and/or data quality issues.

(14) Episode of Care reports: evaluations of overall care provided to members. Both professional and facility cost and utilization figures can be examined to evaluate all elements of a medical case.

(15) Data Directory reports: tutorials for both mainframe and personal computing which provide training on key aspects of national data files. Includes information on what elements are available in the data, how to reference said elements, medical codes used, and identification of data quality issues that should be noted during an analysis.

(16) BCBSM departmental listings: allows integration of the CARS** data base with other files and/or data bases found in other BCBSM departments. Can be used to verify data quality between user departments.

(17) Program development aids: enables CARS** programmers to code and test new options which may eventually be added to the CARS** main menu:

(18) Electronic mail to other CARS** users: allows up to 15 lines of text to be sent to another user's CARS** electronic bulletin board (see Item 1).

(19) Special purpose reports: provide evaluations of day-of-week admissions (for analysis based on hospital admission dates), group members in excess of a requested dollar amount, and more.

3. Efficiency factors: timings

(1) Data Analyzer*** is the entry point to CARS**:

1. Calls COBOL subroutines for data selection.
2. Continues with Data Analyzer*** summarization of selected data.

(2) Given a CARS** Abstract file (LRECL 129 bytes), SAS* Software averages over twice the processing speed of Data Analyzer*** acting alone.

SAS* Software averages almost twice the processing speed of COBOL (when operating as a submode of Data Analyzer***). Please refer to graph below for clarification:

![Performance Data for Abstract Files](image)

Given a CARS** detail file, SAS* Software is shown to decline slightly in efficiency as file size grows (1,611,611 data lines is...