Evaluation of Abstracting:

Cancers Diagnosed in 2002

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SUMMARY

The Minnesota Cancer Surveillance System (MCSS) performed a reabstracting study on a sample of 428 records from ten cancer registries for the primary cancer sites of head and neck, female breast, bladder, and thyroid, and histologies of mesothelioma and lymphoma, diagnosed in 2002. Fifty-four individual data items were reabstracted from each medical record and 50 reported for this study. Data items were grouped into four categories: demographics, cancer, stage, and treatment; data discrepancies were grouped into two categories, related to coding issues and related to software transmission issues. For coding only, overall agreement was 99.0% for demographic data items and 86.0% for variables pertaining to the first course of treatment. Coding agreement for cancer data items by primary site ranged from 68.3% for head and neck to 89.8% for female breast. Coding agreement for staging data items by primary site ranged from 59.5% for lymphoma to 89.8% for female breast. The combined (coding and computer transmission) weighted error rates ranged from 0.0% to 83.1% for individual data items, with many of the highest rates in the American Joint Committee on Cancer (AJCC) stage components calculated for the individual primary sites. Coding errors accounted for most discrepancies; software or transmission errors were noted for 4 records in two treatment data fields. The highest discrepancy rate in coding demographic fields was found in middle name (initial), 3.8%. Discrepancy rates over 10% in cancer fields were found in site for head and neck, breast, bladder, and lymphoma; histology for mesothelioma, breast, and thyroid; and grade for head and neck, mesothelioma, bladder, and lymphoma. Discrepancy rates over 20% were found in tumor size for head and neck, breast, bladder, and thyroid; nodes positive for mesothelioma; nodes examined for head and neck and mesothelioma; summary stage for head and neck, mesothelioma, and lymphoma; certain T, N, and M fields for all sites; AJCC clinical stage for all sites except breast; and AJCC pathologic stage for head and neck, mesothelioma, bladder, and lymphoma. As extensively discussed in the body of the report, many of the discrepancies in the staging fields are attributable to the grouping of stage variables between clinical and pathologic basis for AJCC staging. Discrepancy rates over 20% in treatment fields were found in surgery, scope of nodes, reason no radiation, reason no chemotherapy, hormone therapy date, reason no hormone therapy, and date treatment started.

BACKGROUND AND PURPOSE

The MCSS began collecting information on cancer stage at diagnosis and first course of treatment for cancers diagnosed in 1995. In order to evaluate the quality of the stage and treatment data, as well as that of the demographic and cancer information, annual reabstracting studies were begun in 1997 with data from cases diagnosed in 1995. Formal reabstracting studies are commonly used to verify the accuracy of the data coded in the cancer registry against that contained in the medical record[1]. Accuracy is defined as the level of agreement between codes submitted to the central registry by the hospital registrars and coding assigned by an outside "expert" abstracter who codes the data without knowledge of the values previously assigned by the cancer registrar[2]. A decision was made to strictly interpret all coding rules so that the results present the "worst case scenario" for data quality. As described in this report, many of the discrepancies do not affect the suitability of the data for use. In accordance with North American Association of Central Cancer Registries (NAACCR) procedures, the MCSS elected to do comparative rather than blinded recoding. The purposes of the MCSS annual reabstracting studies are to: (1) estimate the overall and item-specific level of accuracy of the data submitted to the MCSS by hospital cancer registries, (2) identify systematic problems in collecting registry data which can be addressed through input to national standard-setting organizations, (3) identify areas where coding or interpretation of coding

rules can be improved through targeted training, (4) follow the estimated level of data accuracy over time, and (5) provide a mechanism for formal feedback to registrars.

METHODS

Cancers of the primary sites of head and neck, female breast, bladder, and thyroid, and of histologies of mesothelioma and lymphoma were selected for the study. Registry facilities reporting to the MCSS had been ranked by their total reported caseload (Minnesota residents only) for 2002 for the three-year study cycle reviewing cases from the 2002, 2003, and 2004 diagnosis years; the two facilities with the lowest reporting volume were removed from the list, and three strata were formed according to low, medium, and high reporting volume. A stratified systematic sample of facilities was chosen for each year of the study cycle (every third facility). For 2002 data the sample included three facilities from the high volume stratum, four from the medium volume stratum, and three from the low volume stratum.

Up to ten records of analytic cases for each of the four primary sites and lymphoma were randomly selected from the reports submitted by each facility, for a total possible count of 500 records to be reabstracted for these cases. In the instances where a facility did not report at least ten analytic cases for the primary cancer, all the eligible records were reabstracted. All cases of mesothelioma reported from the study facilities were included. The final sample size was 439 records.

Record reabstraction was conducted by one MCSS quality control staff person. Lists of study records were sent out prior to the study date, and the staff person spent approximately two days at each facility. For each record, 54 variables were reviewed and compared to a form containing the corresponding data from the MCSS database as submitted by the registry. New values were noted for each questioned field, and supporting documentation from the medical records was recorded. After record review, MCSS and registry staff either discussed the data discrepancies found, or a form was prepared for registry review and response, listing all discrepancies.

All reabstracting forms were reviewed and assigned a reason for each discrepancy. During the first reabstracting study on 1995 data, it had been noted that data transmission formats and incomplete data transmission contributed to several discrepancies, particularly in the treatment fields. A two-tiered scheme was devised to allow for independently tabulating discrepancies caused by data coding and software issues, and this scheme has been maintained in all subsequent studies.

Data coding discrepancies were divided into seven major categories: missed data, updated information in the registry abstract not sent to the MCSS, coding errors, nonstandard registry coding practice, software-restricted coding, situations with unclear coding rules, and situations with conflicts between the reporting requirements of the MCSS and the American College of Surgeons. Discrepancies classified in the last two groups were not counted in the analysis. Unverifiable data that the registry accepted from another facility were also identified but accepted as given, unless contradicted in the facility or registry records.

Data were double-entered into a database with verification by MCSS data management staff. Discrepancies between the MCSS reabstracted data and the registries' coded data were enumerated, and percent disagreement was computed for each field. Total percent disagreement over the three strata was computed as weighted averages, with the proportions of cases within strata used as weights. Analyses of demographic and treatment data were not stratified by anatomic site. For

analyses of site-specific cancer and stage data, the proportion of cases within strata (weights) were computed using site-specific distributions of potential cases, assuming the original assignment of facilities to strata by volume was the same for all primary sites.

The number of records evaluated for each data item, and thus the denominator for each analyzed variable in the study, varied depending upon certain characteristics of the cases reviewed. The records were evaluated only for demographic variables plus site, laterality, histology, and diagnosis date in four cases where a recurrent cancer was coded as an initial primary cancer, in two instances where review resulted in a change in site/histology that removed the case from the study cancers, and in one case shown to be benign disease on further workup. In terms of AJCC staging, the MCSS requires that registries report only one set of staging variables (clinical or pathologic) for each case; if the study record contained only clinical T, N, M, and stage group values, the pathologic T, N, M, and stage group fields were considered not applicable and not included in the denominator, and conversely for reported pathologic values and empty clinical fields. However, if the study record contained both clinical and pathologic AJCC staging values, both groups of variables were evaluated; and if the study record contained only one set of AJCC staging variables and the other set was considered to be better supported by the staging criteria documented in the medical record, both groups of variables were again evaluated. As discussed in a previous report, inpatient admission and discharge dates were reviewed during data collection but were eliminated from data analysis[3]. The AJCC clinical and pathologic stage descriptors were also reviewed but not included in the final data analysis.

A separate analysis of AJCC staging patterns for all records, first conducted for the 2000 reabstracting study and extensively documented in the report for that year[4] , was repeated for the 2002 data. Clinical and pathologic staging parameters on all study records, as originally reported by the registries, were manually reviewed and summarized by primary site. The clinical or pathologic basis for the reported T, N, and M staging elements in each case was determined primarily from internal evidence in the submitted records; the groupings of all staging elements into either or both clinical and pathologic stage groups were taken directly from the registry reports. (Registry standards through 2003 required the abstracting and reporting of AJCC T, N, and M and stage values grouped together and labeled as a group as meeting clinical or pathologic staging criteria.)

RESULTS

Nine records for which facility charts were unavailable were deleted from the original sample of 439. Two records, removed from the reportable cases in the MCSS database after the study sample was drawn, were also deleted; one was for a non-Minnesota resident, and one was for a case that was not microscopically confirmed, so it did not meet MCSS reportability requirements. The final number of records analyzed was 428: 79 head and neck, 18 mesothelioma, 85 breast, 91 bladder, 65 thyroid, and 90 lymphoma.

Table1 lists by data category (demographic and treatment variables for all records combined, cancer and staging variables by primary site) the percent agreement in coding for all variables by facility stratum, and total agreement rates (weighted by stratum) for software and coding. Tables 2 through 9 list, for each variable, the number and weighted percent of records with software problems or data coding discrepancies and the combined total number and weighted percent of records with either one or both types of discrepancies. The data coding fields are presented by

facility stratum and total. Tables 2 and 9 present the demographic and treatment information, respectively. Tables 3 through 8 present cancer and staging information for the six primary sites. Table 10 lists a total count of major discrepancies in six variables by primary site: site, histology, date of diagnosis, summary stage, AJCC clinical stage group, and AJCC pathologic stage group. Table 11 shows summary data for the staging analysis. Table 12 summarizes the results of reabstracting studies for data from 1995 through 2002 for selected data fields.

Figure 1 presents agreement rates for data coding in the categories of demographic data and treatment data by facility stratum and overall. Figure 2 presents total agreement rates for data coding in the categories of cancer and staging data by primary site. Figures 3 and 4 present total numbers of data coding and software discrepancies for each study variable. The following discussion focuses on specific coding issues from among these categories.

Demographic Fields

Demographic data variables included patient name, address, sex, date of birth, race, and social security number. The data coding agreement rate over all demographic fields was 99.0% (Table 1, Figure 1). The highest weighted percent of records containing discrepancies was 3.8% for middle name (initial); in 11 of 14 cases a middle initial was available in the record but not coded. Of the 8 address discrepancies, the address as reported was partially correct in 4 cases; in 3 cases the address was from a later date than the date of diagnosis. In the 1 case with a date of birth discrepancy, the error was in the month only and did not change the five-year age group at diagnosis for the patient. In 55 cases the facility records reviewed made no mention of race; however the race could have been obtained from electronic records not available to the reabstracter, and the decision was made to code these items as unverifiable data accepted as given, rather than as assumed values. Race was missed in 14 cases and miscoded in 1 case. Social Security Number was incorrectly coded in 2 cases and missed in 1 case.

Cancer Fields

Cancer data fields were primary site, laterality, histology (including behavior), grade, and date of diagnosis. Agreement rates varied by primary site. The total weighted coding agreement rates by site were: head and neck 68.3%, mesothelioma 88.9%, breast 89.8%, bladder 80.1%, thyroid 89.6%, and lymphoma 88.1% (Table 1, Figure 2). The rate of discrepancies for individual fields also varied by primary site. Fields with coding discrepancy rates over 10% for individual sites were: head and neck-33.8% for site, 10.5% for grade; mesothelioma-37.1% for histology, 13.6% for grade; breast-21.7% for site, 23.1% for histology; bladder-46.6% for site, 43.5% for grade; thyroid-41.7% for histology; and lymphoma-33.6% for site, 12.1% for grade (Tables 3-8). None of the cancer fields was affected by software problems.

Of the 123 total coding discrepancies in site, 26 were major discrepancies resulting in a change of primary site: 12 involved head and neck primaries, with 6 of these cases involving a code for an overlapping or NOS site rather than a more specific site as documented; and 14 involved lymphomas, with 11 cases being discrepancies between nodal and extranodal sites (Table 10). One lymphoma case was recoded to multiple myeloma, with a change in primary site from retroperitoneum to bone marrow; another lymphoma case was determined to be benign disease on a more definitive specimen. Three cases with major discrepancies involved the coding of a site of recurrence as the initial primary site. Of the minor discrepancies, resulting in a change in the

subsite or fourth digit of the site code, 46 involved cases where a general site code had been chosen and documentation supported a specific subsite code (14 head and neck, 1 mesothelioma, 6 breast, 23 bladder, and 2 lymphoma). In 21 cases discrepancies resulted from coding single rather than multiple subsites of tumor involvement (1 head and neck, 1 breast, 5 bladder, and 14 lymphoma). The remaining 30 discrepancies related to selection of the best subsite from the record documentation (12 breast, 15 bladder, and 2 lymphoma, with a third lymphoma case recoded as Waldenstrom's macroglobulinemia, with a change in site code from bone marrow to blood).

There were 75 total discrepancies in the histology field, 61 major (difference in first three digits of morphology code), and 14 minor (difference in last two digits of morphology code) (Table 10). The largest number of discrepancies were in thyroid histology (26), and most of these related to an expanded definition for papillary adenocarcinoma in ICD-O-3[5], to include "papillary carcinoma of thyroid"; in 19 cases the code used would have been appropriate in ICD-O-2[6], but was no longer correct for a 2002 diagnosis (all major discrepancies). The remaining discrepancies for thyroid (6 major, 1 minor) involved using the appropriate code for a mixed papillary, papillary microcarcinoma, follicular, or Hurthle cell histology. Most of the discrepancies in breast histology related to correctly applying the complex morphology coding rules published by SEER in August, 2002[7] as a guide to using ICD-O-3 (14 major, 1 minor). In 3 additional cases Paget's disease was not coded, an invasive cancer was coded as in situ, and an in situ cancer was coded as invasive from a recurrent presentation. Two of the major discrepancies in histology in head and neck cancer related to selection of the correct code, and 1 to a discrepancy between in situ and invasive cancer; the remaining 5 discrepancies were minor, reflecting selection of a general code over a more specific code. Five of the 6 discrepancies in mesothelioma histology also reflected selection of a general code rather than a more specific code; the 6th major discrepancy related to coding based on a clinical rather than pathologic diagnosis. All bladder histology discrepancies were major; 5 related to choices between in situ and invasive histologies, 1 related to choice of the appropriate complex morphology code, and 1 code appeared to be a typographical error. Five major and 2 minor discrepancies in lymphoma cases related to selection of the correct code for the reported diagnoses; 2 additional cases were recoded to other primary cancers, 1 to multiple myeloma and 1 to Waldenstrom's macroglobulinemia, based on record review; 1 case was determined to be benign upon further workup.

Most of the grade discrepancies occurred in coding bladder cancers, and 28 of the 38 discrepancies resulted from not applying the ROADS[8] conversion table for a three-grade system to a four-grade code; in all these cases where a grade was expressed as "2/3" or "3/3", the grade was coded by the registry as "2" or "3" rather than as "3" or "4" per the table. Another five discrepancies resulted from incorrectly applying the ROADS conversion table for the terms "low grade" and "high grade". In other cases grade was missed or the highest grade was not coded from a relevant pathology report. The second largest number of discrepancies occurred for lymphomas, where "B-cell" and "T-cell" designations were not coded in 13 cases, and a "grade" term within the histology name was incorrectly coded in 1 case. Grade discrepancies for other sites resulted from grade not being coded where reported in 5 cases, grade coded where not reported in 4 cases, grade coded from a recurrent or metastatic site in 5 cases, and grade miscoded in 7 cases.

Fourteen coding discrepancies were noted in the date of diagnosis. Two dates were discrepant by one or two days. In 6 cases a prior biopsy was not coded, and only 1 of these resulted in a date change greater than one month (based on other information available to the MCSS). In 4 cases registries reported nonanalytic cases with a previous diagnosis as a new cancer with a current

diagnosis date. In 1 case the registry reported a date 15 months earlier than the actual diagnosis date; this date is related to some clinical information, but appears to be erroneous for the cancer diagnosis. Again, the diagnosis date for the benign case was coded as a major discrepancy. In 33 cases the registry reported a clinical diagnosis date; MCSS policy is to collect pathologic diagnosis dates, but the coding standards in the ROADS[9] specify a clinical date, and these cases were not counted as discrepant. The largest percentages of clinical diagnosis dates were reported for head and neck cancers (6 cases, 7.6%), breast cancer (7 cases, 8.1%) and thyroid cancer (9 cases, 13.8%).

Staging Fields

Staging data variables were tumor size, nodes positive, nodes examined, metastases, summary stage, and American Joint Committee on Cancer (AJCC) clinical and pathologic T, N, M, and stage group. The data coding agreement rate varied by primary site: head and neck overall coding agreement was 72.0%; mesothelioma, 60.6%; breast, 89.8%; bladder, 72.5%; thyroid, 86.8%; and lymphoma, 59.5% (Table 1, Figure 2). The highest combined (coding and software) discrepancy rates by site were: head and neck-49.0% for clinical N, 48.3% for AJCC pathologic group, and 46.4% for AJCC clinical group; mesothelioma-75.3% for pathologic T, N, and M, 63.0% for AJCC pathologic group, and 54.3% for clinical T, N, and M; breast-28.7% for clinical N, 23.9% for clinical T, and 21.4% for tumor size; bladder-64.0% for pathologic T, 57.3% for AJCC pathologic group, and 45.5% for AJCC clinical group; thyroid-37.2% for clinical T and M, and 34.4% for clinical N; lymphoma-83.1% for AJCC pathologic group, 67.1% for AJCC clinical group, and 66.4% for pathologic T, N, and M (Tables 3-8). There were no software problems with the reporting of staging fields.

Coding discrepancies were noted in tumor size in 97 of the records reviewed. Size was available in the record but not coded in 43 cases, with most of the missed sizes in bladder (24 cases) and thyroid (8 cases). A size other than the correct primary tumor dimension was coded in 27 cases, with most of these discrepancies occurring in bladder (10 cases) and head and neck cancers (8 cases). A size other than "999" was coded for lymphomas in 13 cases. Decimal place errors occurred in 11, including 5 thyroid cases.

Coding discrepancies in nodes positive and nodes examined were found in 42 and 49 records, respectively. Most discrepancies within the two fields resulted from incorrect coding of the two fields for lymphomas, with a value other than "99" for both fields being entered in 16 cases. Other reasons for discrepancies included: nodes positive/examined being missed in 7 cases; incorrect codes being used in 5 cases for both fields and in another 5 cases for nodes examined; and the first echelon of nodes being coded in 5 thyroid cases. These nodes were specifically excluded from staging of thyroid cancer in the AJCC 5th Edition, and from coding of regional nodes fields in the ROADS manual (though they are included in the nodal staging parameters in the AJCC 6th Edition). Nodes positive/examined were not coded "99/99" in 4 cases with neoadjuvant treatment. Causes of coding discrepancies in the metastases fields included missing all or some involved sites (5 records), coding uninvolved sites (5 records), and coding metastases for lymphoma (3 records).

Coding agreement rates for the three staging schemes varied by primary site (Tables 3-8). Agreement for summary stage was 92.9% for breast, 92.6% for bladder, and 96.3% for thyroid. Agreement was 91.4% for AJCC pathologic stage for thyroid. Agreement was between 80% and 89% for AJCC clinical and pathologic stage for breast. Agreement was between 70 and 79% for

summary stage for head and neck and lymphoma. Agreement was less than 70% for AJCC stages for head and neck, summary stage and AJCC stages for mesothelioma, AJCC stages for bladder, AJCC clinical stage for thyroid, and AJCC stages for lymphoma. Agreement for the individual T, N, and M components of the AJCC stage group is also detailed in Tables 3-8.

For all summary stage values, the numbers of major discrepancies (resulting in a change between stage groups) and minor discrepancies (resulting in a change within regional stage groups) for each primary site were: head and neck, 12 major and 4 minor; mesothelioma, 6 major; breast, 3 major and 3 minor; bladder, 7 major; thyroid, 3 major and 2 minor; lymphoma, 16 major and 3 minor (Table 10). The largest number of discrepancies, 29, related to an incorrect assignment of Summary Stage 2000 based on the extent of disease as coded in the AJCC T, N, and M staging parameters, with most of these cases occurring in head and neck cancers (13), and also in lymphoma (5). In 4 of these head and neck cases the registrar apparently translated the AJCC "T2" to regional or "2" in Summary Stage, and in 2 cases involvement of the underlying mandible was coded as distant or "7" rather than regional; in 3 of these lymphoma cases, an incorrect code was used for regional NOS or "5". In 19 cases review determined a change in AJCC T, N, and M values and stage grouping with a corresponding change in summary stage, with most of these cases occurring in lymphoma (12). In 10 of the 12 lymphoma cases review resulted in coding a higher stage, 7 cases going to distant stage and 3 going to regional stage; 2 cases went to a lower stage, with no documentation available to support the assignment of regional and distant stage respectively. In 6 cases staging was based either on biopsy or surgery results, where staging assignment would be different from a review of both procedures and pathology reports; 3 of these cases were bladder cancers. In 2 cases, mesothelioma and breast, staging was assigned based on disease progression after the initial time of diagnosis. In 1 breast case, involvement of the dermis, not involved in AJCC staging, was not recognized as pertinent to summary stage assignment. In 2 cases neither AJCC stage nor summary stage was assigned, when review determined that the cases were able to be staged; summary stage was left blank in 1 lymphoma case that was assigned an AJCC stage.

A major source of AJCC staging discrepancies in MCSS reabstracting studies has been clinical/pathologic staging conflicts. This type of discrepancy is also present in this study year. These conflicts included: the use of pathologic staging elements in clinical staging; the recording of pathologic staging as clinical staging; assignment of pathologic staging in cases where the primary surgical procedure did not meet the pathologic criteria; assignment of clinical staging only in cases meeting the criteria for pathologic assignment; and assignment of pathologic staging only in cases with neoadjuvant treatment where clinical staging is preferred. Another source of discrepancy in staging was the use of an incorrect form where a case was not staged, such as "88" (not applicable) for "99" (unknown stage), considered a minor discrepancy.

For AJCC clinical stage group, the number of discrepancies attributed to clinical/pathologic staging conflicts were: head and neck, 13; mesothelioma, 3; breast, 2; bladder, 23; thyroid, 5; lymphoma, 12. This type of discrepancy accounted for 56.9% of all discrepancies in this field. For the other discrepancies, the numbers of major discrepancies (resulting in a change between stage groups) and minor discrepancies (resulting in a change within a stage group) for each primary site were: head and neck, 4 major and 1 minor; mesothelioma, 2 major; breast, 3 major; bladder, 7 major and 2 minor; lymphoma, 11 major and 14 minor (Table 10).

The single largest group of discrepancies were minor changes in lymphoma staging in 13 cases, with recoding of the "A" and "B" values assigned or not assigned to the stage groupings. T, N, or

M values were recoded in 9 cases (head and neck, mesothelioma, breast, bladder), resulting in a change in final stage grouping; lymphoma staging was recoded in 10 cases. A change in a T, N, or M value from "X" to "0" allowed assignment of stage in 3 cases; a change in assignment between T values of "A" and "IS" in 2 bladder cases changed the recording of the in situ stage between "0A" and "0IS"; the T, N, and M values were grouped incorrectly into a final stage in 1 case; and "02" was recorded for a stage group of "2" in 1 case. Two cases, breast and bladder, were reported without staging where stage was assignable based on the record documentation.

For AJCC pathologic stage group, the number of discrepancies attributed to clinical/pathologic staging conflicts were: head and neck, 17; mesothelioma, 2; breast, 2; bladder, 25; thyroid, 2; lymphoma, 30. This type of discrepancy accounted for 61.9% of all discrepancies in this field. For the other discrepancies, the numbers of major and minor discrepancies for each primary site were: head and neck, 6 major and 1 minor; mesothelioma, 2 minor; breast, 5 major; bladder, 3 major; thyroid, 5 major; lymphoma, 10 major and 16 minor (Table 10).

The single largest group of discrepancies in AJCC pathologic staging were minor discrepancies in lymphoma staging in 15 cases, related to the coding of "A" and "B" classifications for the stage groups ("A" indicating no systemic symptoms, "B" indicating the presence of systemic symptoms). T, N, or M values were recoded in 12 cases (head and neck, breast, bladder, and thyroid), resulting in a change in final stage grouping; lymphoma staging was recoded in 8 cases. Six cases from all sites except bladder and mesothelioma were reported without staging where stage was assignable; 2 mesothelioma cases without staging were reported with blanks instead of "88" in the staging fields. Stage was reported for progressive disease in 1 breast case, and staging was recorded for a histology without AJCC staging in 1 breast case. A subdivision code for the stage group ("A", "B", or "C") was not recorded in 1 head and neck case; the T, N, and M values were grouped incorrectly into a final stage in 1 case; "02" was recorded for a stage group of "2" in 1 case.

An analysis of clinical and pathologic staging elements, first conducted for the 2000 reabstracting study, was repeated for this study of 2002 cases; as noted above, most variation occurred in the patterns of recording staging elements and stage groupings for head and neck, bladder, and lymphoma. Table 11 illustrates the staging patterns for the six study sites. About equal numbers of head and neck cancers were recorded with clinical (40 of 79 cases) and pathologic staging (42 cases). Within the stage groups for head and neck, there was much variation in combining clinical and pathologic T, N, and M elements together; and within the pathologic stage groups, 15 cases were staged with clinical N and 24 with pathologic N. The largest number of mesothelioma cases were staged clinically (7 of 18 cases), and the largest number of breast cases were staged pathologically (60 of 85 cases). Most bladder cancers (54 of 90 cases) were reported with clinical staging; however 24 cases that did not meet criteria for pathologic staging were reported as pathologically staged, with variation among the cases in reporting N and M values as "0" or "X". Most of the thyroid cancers were reported with pathologic staging; 25 (of 65) cases were pathologically grouped with a pathologic N value and 30 with a clinical N value. Lymphoma cases were divided between clinical (30 of 90) and pathologic (36) staging, with the largest number of cases (22) of any of the primary sites in the study being reported with both clinical and pathologic staging. For the reabstracting analysis, pathologic N values were required for pathologic staging of head and neck cancers, and the clinical N values were accepted for pathologic staging of the thyroid cancers. Pathologic stage grouping was not accepted for the bladder cancers with clinical T values. Pathologic stage grouping was accepted for the lymphomas if the highest stage reported was proven pathologically, or if a single nodal or extranodal mass was excised for a Stage I cancer.

Treatment Fields

Treatment data included variables pertaining to type of therapy given and therapy start dates. The data coding agreement rate for treatment fields was 86.0% (Table 1, Figure 1). The highest combined error rates for coding and software occurred in treatment fields for surgery (28.0%), scope of nodes (21.6%), reason no radiation (23.2%), reason no chemotherapy (25.0%), hormone treatment date (20.6%), reason no hormone treatment (33.2%), and date treatment started (20.2%), (Table 9). Software-associated problems affected only two fields, surgery and radiation. These software issues are interesting, in that the surgery issue (the replacement of a valid surgery code with "00" in the registry software) is a reminder of a problem that showed up much more frequently in earlier years, and the radiation issue (replacement of a valid radiation code with an invalid code "6") is a harbinger of a registry data conversion issue. Both problems were identified and tracked outside of the reabstracting studies, but not resolved in all instances.

The type of surgery coding discrepancy varied by primary site. For head and neck, breast, and bladder cancers, the largest number of discrepancies related to selection of the appropriate surgery code (head and neck 18, breast 10, bladder 11). Less specific codes were used in another group of cases for these sites (head and neck 4, breast 9, bladder 2). For the other three cancers, the largest number of discrepancies related to reporting of the surgery performed. In 6 cases of mesothelioma, surgery was performed but not picked up or reported by the registry. In 12 cases of thyroid cancer the first surgical procedure performed was reported, but the completion thyroidectomy or near total thyroidectomy was not reported; thyroidectomy was performed but no surgery reported in 1 more case. Excisional biopsy procedures were performed but not reported in 14 lymphoma cases. Surgery was also performed but not reported for 2 breast cases, and there were discrepancies in selection of codes for 3 thyroid and 8 lymphoma cases. Biopsy procedures were reported as surgery in 12 cases from all primary cancers except breast; in 1 of these cases, a bladder cancer, it was unknown if surgery was actually performed elsewhere.

The largest number of discrepancies in the scope of nodes field (40) relate to the use of "0" instead of "9" in coding this field for nodal lymphomas, per published standards. The next largest number (18) relates to the use of non-specific codes where documentation supported more specific codes, in all four primary site cancers but mostly within head and neck coding (12 cases). Nodal surgery was performed but not coded or reported in 15 cases from head and neck, mesothelioma, and breast cases. 2002 staging and surgery standards specifically excluded the first level of perithyroidal nodes from regional node coding[10], but these nodes were included in the scope of nodes field in 3 cases. The pattern of discrepancies in the field regional nodes removed is similar to that in the field scope of nodes: 40 nodal lymphoma records with a code of "00" in this field rather than the standard of "99"; 10 cases where nodal surgery was performed but not reported from the primary cancers of head and neck, mesothelioma, and breast; and 3 thyroid cases reporting nodes that were nonregional by definition. In addition, the count of nodes was incorrect in 7 cases, 5 from head and neck cancers. For the field surgery of other sites, codes were missed in 7 cases across all cancers and entered incorrectly for miscellaneous reasons in another 7 cases. Of the discrepancies in the reason no surgery field, 19 resulted from recoding surgery fields to treatment given, no treatment given, or treatment unknown; 21 resulted from inconsistent coding with the surgery fields. Twenty-one discrepancies in this field were attributed to a software program that did not allow specific collection of the data for the field and reported "9" where no surgery was performed. In 8

of these cases surgery was actually performed, and the appropriate value would be "0"; the appropriate value for the other 13 records would be "1", no surgery recommended. In only 3 cases was the value for the field recoded to indicate a different reason for no surgery performed.

Most of the discrepancies in surgery date also reflected a recoding between surgery given or not given (34 cases). In 16 cases the discrepancy involved a conflict between incisional and excisional biopsy dates, mainly in breast cases. In 3 cases the dates were off by one or two days. Corresponding to the discrepancies in surgery date, discrepancies in the date treatment started involved 21 conflicts between excisional and incisional biopsy dates (mainly in breast and bladder cases); in another 5 cases with cancer treatment other than surgery, the date treatment started was coded as the initial biopsy date. In 7 cases without treatment, the date of treatment was coded to the date of biopsy or “0” filled, rather than being coded to the date of decision for no treatment. There were 10 cases where the first date of treatment was coded for a later treatment, even though the registry record also contained a date for the earlier treatment, and an additional 8 lymphoma cases where the surgery date was not coded so that the date treatment started was incorrectly tied to later chemotherapy.

Most discrepancies within the radiation treatment field were for treatment information that was missed or not updated to the MCSS (16 of 24 records). Radiation was miscoded in 3 cases, and unknown treatment coded as no treatment in 5 cases. Chemotherapy information was missed or not updated to the MCSS in 7 cases, coded when not given as part of first course of therapy in 2 cases, miscoded in 7 cases, and unknown treatment coded as no treatment in 5 cases. Most cases of unknown chemotherapy involved lymphoma. Hormone therapy was missed or not updated to the MCSS in 38 cases, coded when not given as part of first course of therapy in 3 cases, and unknown treatment coded as no treatment in 19 cases. Records with discrepancies in this field involved primarily breast and thyroid cancers and lymphoma; in 17 of 19 lymphoma cases where hormone therapy was not coded, the hormone therapy was included as part of a chemotherapy treatment regimen which was coded. Immunotherapy was missed or not updated to the MCSS in 19 cases, another type of cancer or ancillary treatment coded as immunotherapy in 3 cases, and subsequent treatment coded as initial treatment in 1 case. As with hormone therapy, in 17 of 19 lymphoma cases where immunotherapy was not coded, the therapy was included as part of a chemotherapy treatment regimen which was coded. (Hormone therapy was coded as unknown when the treatment regimen for lymphoma was unknown, immunotherapy was not so coded.)

The discrepancy patterns for the therapy date fields were very similar to the patterns for the treatment fields. The patterns of discrepancies in the fields for reason no radiation, chemotherapy, and hormone therapy were also similar, with two additions. The fields were reported as blank in 7 cases for reason no radiation, in 16 cases in reason for no chemotherapy, and in 33 cases for reason no hormone therapy. Radiation was reported as given in 2 of the 7 cases, chemotherapy was reported as given in 3 of the 16 cases, and hormone therapy reported as given in none of the 33 cases. The fields were reported as "9" when treatment was not given, from the software system that did not provide for separate recording of the reason no treatment variable, in 44 instances for reason no radiation, in 44 instances for reason no chemotherapy, and in 36 instances for reason no hormone therapy. Most of the discrepancies in the surgery/radiation sequence field occurred in the records for one facility (18 of 38 total discrepancies), which as a matter of policy did not code this field. Other discrepancies were related primarily to missed treatment (16 cases) or miscoded treatment (3 cases).

DISCUSSION

Few discrepancies were found in demographic data. With the increasing use of electronic records in hospital facilities, it becomes more difficult in a reabstracting study to distinguish between race code based on assumption and race coded based on medical chart information. No chart information on race was available at the study review for 54 of the 428 analyzed cases; race was accepted as coded for these cases. The largest percentage of discrepancies was in the middle name (initial) field, which may be used to help distinguish between patients with the same first and last names.

Cancer data items were generally in agreement with the information in the medical record. Discrepancies in coding breast subsites have been noted in every reabstracting study, and registrars traditionally have tended to code bladder with an "NOS" (not otherwise specified) code rather than bladder subsites. Head and neck sites, especially those within the oral cavity, are difficult to code; selection of primary site for head and neck cancers is one of the major issues being addressed by the national committee, spearheaded by SEER, which is promulgating new primary/histology coding rules to be released for 2007 diagnoses. The findings of greatest concern for the cancer fields in this study are the discrepancies between nodal and extranodal sites, and the coding of recurrent disease as new cancers. Histology coding discrepancies, especially for breast and thyroid cancers, reflect changes in histology coding which should have been implemented with the use of the ICD-O-3 coding standard in 2001. Training may be beneficial in updating information about specificity in site coding, changes in histology coding, and reminders to review records thoroughly for patient histories. Lymphomas are a difficult cancer to code consistently, and full documentation on the diagnostic workup for these cancers particularly may not always be included within hospital records; education on lymphoma is usually a very welcome topic at registrar workshops. Consistency in coding grade for bladder cancers continues to be elusive, as registrars resist converting a three-grade expression on pathology reports to a four-grade coding system per published standards.

The hospital charts do not always contain biopsy information, and in 19 cases the diagnosis date was accepted as reported. It was noted that in 33 cases the registry was actually coding a clinical rather than a pathologic diagnosis date. The MCSS policy is to collect pathologic diagnosis date; however the practice of recording clinical date agrees with coding standards from the American College of Surgeons, and these cases were not counted as discrepant.

The distinction between clinical and pathologic staging had the greatest impact on staging for bladder cancers and lymphomas, and the least impact on staging for breast and thyroid cancers. Discrepancy rates for clinical staging for breast and thyroid cancers and pathologic staging for mesothelioma were most affected by low numbers. Most registries provide only pathologic staging for breast and thyroid cancers and clinical staging for mesothelioma, and cases with valid staging in the AJCC group reported were not included in the denominators for the other group. Likewise, the disagreement rates for both AJCC clinical and pathologic staging for head and neck, bladder, and lymphoma cancers were affected by the inconsistency in applying staging criteria to case information, with the result that staging recorded as either clinical or pathologic was in many cases determined to be coded incorrectly by staging criteria and both groups of staging variables counted as discrepant. A special review of staging patterns was conducted as part of this analysis, to more precisely define the nature of variability in reported clinical and pathologic staging. As in previous

reabstracting studies, this analysis shows consistency in coding clinical stage across primary sites, except for bladder, when both T and N values are clinically derived, consistency in coding pathologic stage when both T and N values meet pathologic criteria, and variability by primary site in assigning stage for the combination of pathologic T and clinical N values. For this study, the variability in pathologic T and clinical N in pathologic staging showed up in the staging discrepancy rates for head and neck cancers but not for thyroid cancers, as the combination was not accepted for the first group of sites but was for thyroid. The discrepancies in assignment of clinical or pathologic staging group to bladder cancers relate to whether cystoscopic biopsy and resection of the bladder tumor is accepted as a basis for pathologic staging, versus cystectomy; transurethral resection of bladder tumor was not accepted as meeting pathologic criteria for this reabstracting study. The advent of the Collaborative Staging system[12] for cancers diagnosed in 2004 and later should eliminate many of these distinctions between clinical and pathologic criteria, both in original abstracting of cases and in reabstracting reviews, as the system is designed to provide a clinical or pathologic evaluation code to the individual T, N, and M staging elements, and then to group them into a single best derived stage, for cancer registry purposes.

Summary stage coding agreement rate was high for breast, bladder, and thyroid in this study. It was lowest for mesothelioma, the least common site, and comparable for head and neck and lymphoma. Two changes in coding standards since the abstracting of 2002 data may help to promote greater consistency in stage for head and neck and lymphoma cases. AJCC staging for head and neck cancers for most sites depends on size of tumor for assignment of T1, T2, and T3 parameters, while summary stage requires the assessment of anatomic extent of disease, regardless of size of the primary tumor. The AJCC 6th Edition[11], implemented for 2003 diagnoses, is more specific with regard to anatomic sites which are encompassed within T4 than the 5th Edition; and the Collaborative Stage system[12], implemented for 2004 diagnoses, derives both AJCC stage and summary stage values based on size and anatomic extent coding. So by registrars will be coding within a single system for head and neck cancers, and the AJCC and summary stage values will be derived by computerized algorithm. The most significant change for assignment of stage for lymphoma is embodied in the revised text of the AJCC 6th Edition for lymphoid neoplasms, which is greatly expanded over material in previous editions, provides definitions for lymph node regions and extranodal involvement, and reserves the assignment of pathologic staging to staging laparotomy procedures.

Reported treatment information has an overall accuracy rate of 86.0%, which is lower than rates for previous reabstracting years. The most significant continuing issues are recognizing the distinction between incisional or diagnostic and excisional or treatment biopsies, coding unknown treatment when appropriate rather than no treatment, and recording and updating to the MCSS treatment information that becomes available after a case is initially abstracted and submitted. Additional issues affecting discrepancy rates for this study year include coding for lymphomas and coding fields for reason for no treatment. Coding excisional biopsies of lymph nodes as surgery for lymphomas (accepted as the standard for this study) has been an issue of concern among registrars; the two nodal surgery fields (scope of nodes and regional nodes removed) also have specified values for lymphomas, and registrars have not always entered "9/99" versus "0/00" in these fields. Treatment regimens were not fully coded for lymphomas in numerous cases, both for treatment known to be given and treatment unknown whether given. Two common reasons for the discrepancies in the reason no treatment fields were reporting of blank fields and nonspecific defaulting in these fields in reporting from a software system that did not support registrar coding of the fields. Training for appropriate treatment coding of lymphomas may address some of the

problems identified. The use of standardized edits, implemented by MCSS in 2004, to enforce coding patterns by site or histology will eliminate the types of problems shown with the nodal surgery fields, and also the problems with reporting of empty fields. Standard edits have not been developed to address the issue of expected but uncoded data relationships, such as a query about the inclusion of a hormonal agent in a multi-agent treatment regimen for non-Hodgkin lymphoma.

Comparing the results of this 2002 reabstracting study with prior data studies (Table 12) demonstrates that the impact of software problems on data quality has stabilized. Coding agreement rates have been comparable over time for demographic fields, ranging between 96 and 99%; Agreement rates for treatment fields have been above 90% for all study years except for 2002. Coding agreement rates in cancer and staging fields are very site-specific. Female breast has been included as a study site for all study years, so that comparisons in data quality for one site could be made across all facilities and over time. Coding agreement rates for breast cancer fields have been fairly uniform, with agreement rates for cancer fields ranging between 88.3% and 93.3%, agreement rates for staging fields ranging between 83.6% and 91.3%, and agreement rates for summary stage field ranging between 92.5% and 98.6%.

In reviewing these reports to assess the suitability of Minnesota registry data for use, epidemiologists should be aware of the coding structures used by registrars, site-specific issues that result from these structures, the effects of changes in coding structures, and with specific regard to the reports, the summation of all discrepancies for a data field into a single number. For example, disagreement rates include both major and minor discrepancies reflected in one number, and the potential for a high number of minor discrepancies can be very site-specific: 9 distinct codes are available for coding "breast" as a primary site of cancer, 1 code is available for coding "thyroid" as a primary site. Within the staging fields, many of the discrepancies in lymphoma staging relate to the coding of "A" and "B" stage modifiers, indicating the absence or presence of systemic symptoms. Summary Stage may be the most reliable single stage value available for pre-2004 cases, given the problems identified and discussed at length regarding AJCC staging; however individual T, N, and M variables may reflect reliable values, and other fields within the abstracted records provide evidence for whether T, N, and M values individually meet clinical or pathologic staging criteria. Consistent patterns of AJCC stage assignment by primary site are evident within the reported data. Data users must also be aware of the effects of changes in data standards, in terms of which data fields or groups of fields are being modified for which diagnosis years, how software vendors need to respond in terms of modifying their abstracting screens and their reporting programs, and how much of a break between old and new registrar coding habits are called for by the changes. For example in this study year, thyroid histology issues reflect the persistence of a longstanding coding pattern for "papillary carcinoma" that was modified with the publication of ICD-O-3 and the subsequent development of new rules for using both new and retained codes in the manual. The text of these reports attempts to clarify what are structural or systematic issues with the data, which epidemiologists can address and account for, versus errors specific to coding individual case records.

FUTURE PLANS

Individual reports from the reabstracting study will be prepared for each participating facility, focusing on areas of coding disagreement, providing comparisons to the study group as a whole and to facilities of similar size, and providing information to improve future data quality. The MCSS will continue to include breast cancer in all reabstracting studies, and will be revisiting facilities and primary sites on a three-year cycle; the MCSS plans to monitor trends in data quality for breast cancer specifically, and for other sites as comparative data become available. The MCSS will continue to sponsor training workshops focusing on data quality issues, bringing in national speakers and also developing presentations by MCSS staff. The MCSS will continue to encourage appropriate workshops hosted by the Minnesota Cancer Registrars Association (MCRA), and will continue to contribute articles on data quality issues to the newsletter published by the MCRA. The MCSS will continue to work closely with software vendors to assure that data can be abstracted according to current standards and are transmitted in the required reporting formats.

The MCSS developed and released its first edits metafile, based on the NAACCR 10C metafile, for use by reporting registries in the summer of 2004. The MCSS also plans to review prior data submissions using the edits metafile internally, and to update data items as possible to ensure quality and consistency of coding across the registry database. It is anticipated that this will have the greatest impact on the quality of treatment coding. The MCSS will continue to update its edits metafile as new standards are released, and to develop and modify edits as appropriate to ensure that this mechanism is as effectively as possible to promote data quality.

Through future reabstracting studies, the MCSS will continue to track the impact of changing data standards on data quality. New standards implemented since the collection of data for cases diagnosed in 2002 include the *AJCC Cancer Staging Manual*, 6th Edition, and the *Facility Oncology and Registry Data Standards* (FORDS), implemented for cases diagnosed in 2003. The Collaborative Staging system has been implemented for cases diagnosed in 2004. As noted in the discussion, the registry community also anticipates the promulgation of new multiple primary and histology coding rules for 2007 diagnoses. Ideally, the publication of new standards resolves data consistency issues previously identified, although each standard also brings new challenges in implementation and interpretation.

Table 1. Coding/Software Agreement in Data Categories: Demographics, Treatment, Cancer and Staging by Primary Site

	Coding								Software	
	High		Medium		Low		Total *		Total *	
	No.	%	No.	%	No.	%	No.	%	No.	%
Demographic Fields										
N records = 428, N fields = 11										
Valid observations **	1,738		2,046		924		4,708		4,708	
Agreement	1,718	98.8	2,024	98.9	920	99.6	4,662	99.0	4,708	100.0
Treatment Fields										
N records = 421, N fields = 21										
Valid observations **	3,276		3,843		1,722		8,841		8,841	
Agreement	2,766	84.4	3,479	90.5	1,480	85.9	7,725	86.0	8,837	99.9
Cancer Fields - Head and Neck										
N records = 79, N fields = 5										
Valid observations ***	144		195		54		393		393	
Agreement	83	57.6	173	88.7	44	81.5	300	68.3	393	100.0
Cancer Fields - Mesothelioma										
N records = 18, N fields = 5										
Valid observations ***	75		15		0		90		90	
Agreement	69	92.0	12	80.0	0	na	81	88.9	90	100.0
Cancer Fields - Female Breast										
N records = 85, N fields = 5										
Valid observations **	145		175		105		425		425	
Agreement	130	89.7	164	93.7	89	84.8	383	89.8	425	100.0
Cancer Fields - Bladder										
N records = 91, N fields = 5										
Valid observations **	144		195		115		454		454	
Agreement	115	79.9	156	80.0	93	80.9	364	80.1	454	100.0
Cancer Fields - Thyroid										
N records = 65, N fields = 5										
Valid observations ***	145		150		30		325		325	
Agreement	131	90.3	131	92.4	27	90.0	289	89.6	325	100.0
Cancer Fields - Lymphoma										
N records = 90, N fields = 5										
Valid observations ***	135		197		114		446		446	
Agreement	122	90.4	165	83.8	98	86.0	384	88.1	446	100.0

Table 1. Coding/SoftwareAgreement in Data Categories: Demographics, Treatment, Cancer and Staging by Primary Site (continued)

	Coding								Software	
	High		Medium		Low		Total *		Total *	
	No.	%	No.	%	No.	%	No.	%	No.	%
Staging Fields - Head and Neck										
N records = 77, N fields = 13										
Valid observations ***	288		403		110		801		801	
Agreement	205	71.2	321	79.7	71	64.5	597	72.0	801	100.0
Staging Fields - Mesothelioma										
N records = 18, N fields = 13										
Valid observations ***	147		31		0		178		178	
Agreement	92	62.6	17	54.8	0	na	109	60.6	178	100.0
Staging Fields - Female Breast										
N records = 85, N fields = 13										
Valid observations ***	265		343		213		821		821	
Agreement	238	89.8	319	93.0	182	85.4	739	89.8	821	100.0
Staging Fields - Bladder										
N records = 90, N fields = 13										
Valid observations ***	300		371		271		942		942	
Agreement	217	72.3	314	84.6	153	56.5	684	72.5	942	100.0
Staging Fields - Thyroid										
N records = 65, N fields = 13										
Valid observations ***	277		298		66		641		641	
Agreement	251	90.6	250	83.9	50	75.8	551	86.8	641	100.0
Staging Fields - Lymphoma										
N records = 86, N fields = 13										
Valid observations ***	291		429		242		962		962	
Agreement	175	60.1	308	71.8	97	40.1	580	59.5	962	100.0

* Total percentages weighted by stratum size to reflect state total

** Valid observations = N fields in N records reabstracted, sorted by strata

*** Valid observations = N fields reabstracted in N records, sorted by strata (not all fields reabstracted in all records)

Table 2. Records with Discrepancies in Demographic Fields

	Coding Errors								Software Errors		Combined Errors	
	High**		Medium***		Low****		Total *		Total *		Total *	
Field	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Last Name	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
First Name	1	0.6	0	0.0	0	0.0	1	0.4	0	0.0	1	0.4
Middle Name	7	4.4	4	2.2	3	3.6	14	3.8	0	0.0	14	3.8
Address	2	1.3	5	2.7	1	1.2	8	1.6	0	0.0	8	1.6
City	0	0.0	2	1.1	0	0.0	2	0.2	0	0.0	2	0.2
State	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Zip Code	0	0.0	2	1.1	0	0.0	2	0.2	0	0.0	2	0.2
Sex	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Date of Birth	0	0.0	1	0.5	0	0.0	1	0.1	0	0.0	1	0.1
Race	7	4.4	8	4.3	0	0.0	15	3.7	0	0.0	15	3.7
SSN	3	1.9	0	0.0	0	0.0	3	1.2	0	0.0	3	1.2

* Total percentages weighted by stratum size to reflect state total

** Denominators for all fields: 158

*** Denominators for all fields: 186

**** Denominators for all fields: 84

Note: Data for the individual strata (high, medium, low) are not shown for the software and combined totals.

Table 3. Records with Discrepancies in Cancer and Staging Fields: Head and Neck

	Coding Errors								Software Errors		Combined Errors	
	High**		Medium***		Low****		Total *		Total *		Total *	
Field	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Site	9	31.0	13	33.3	5	45.5	27	33.8	0	0.0	27	33.8
Histology	2	6.9	4	10.3	2	18.2	8	9.4	0	0.0	8	9.4
Laterality	0	0.0	0	0.0	1	9.1	1	1.5	0	0.0	1	1.5
Grade	3	10.7	4	10.3	1	10.0	8	10.5	0	0.0	8	10.5
Dxdate	2	6.9	1	2.6	1	9.1	4	6.3	0	0.0	4	6.3
Tumor Size	6	21.4	10	25.6	3	30.0	19	23.7	0	0.0	19	23.7
Nodes Positive	5	17.9	4	10.3	3	30.0	12	18.1	0	0.0	12	18.1
Nodes Examined	7	25.0	5	12.8	4	40.0	16	24.7	0	0.0	16	24.7
Distant Mets	0	0.0	3	7.7	0	0.0	3	1.7	0	0.0	3	1.7
Summary Stage	7	25.0	7	17.9	2	20.0	16	22.6	0	0.0	16	22.6
T Clinical	8	50.0	5	20.0	3	33.3	16	40.7	0	0.0	16	40.7
N Clinical	9	56.3	8	32.0	4	44.4	21	49.0	0	0.0	21	49.0
M Clinical	7	43.8	4	16.0	4	44.4	15	37.8	0	0.0	15	37.8
AJCC Clin Group	9	56.3	5	20.0	4	44.4	18	46.4	0	0.0	18	46.4
T Pathologic	4	19.0	7	25.9	3	50.0	14	25.5	0	0.0	14	25.5
N Pathologic	9	42.9	9	33.3	3	50.0	21	41.9	0	0.0	21	41.9
M Pathologic	2	9.5	5	18.5	2	33.3	9	15.3	0	0.0	9	15.3
AJCC Path Group	10	47.6	10	37.0	4	66.7	24	48.3	0	0.0	24	48.3

* Total percentages weighted by stratum size to reflect state total

** Denominators for cancer fields - grade: 29, grade + fields through summary stage: 28, AJCC clin: 16, AJCC path: 21

*** Denominators for fields through summary stage: 39, AJCC clinical: 25, AJCC pathologic: 27

**** Denominators for cancer fields - grade: 11, grade + fields through summary stage: 10, AJCC clin: 9, AJCC path: 6

Note: Data for the individual strata (high, medium, low) are not shown for the software and combined totals.

Table 4. Records with Discrepancies in Cancer and Staging Fields: Mesothelioma

	Coding Errors								Software Errors		Combined Errors	
	High**		Medium***		Low****		Total *		Total *		Total *	
Field	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Site	1	6.7	0	0.0	0	0.0	1	4.9	0	0.0	1	4.9
Histology	4	26.7	2	66.7	0	0.0	6	37.1	0	0.0	6	37.1
Laterality	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Grade	1	6.7	1	33.3	0	0.0	2	13.6	0	0.0	2	13.6
Dxdate	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Tumor Size	2	13.3	0	0.0	0	0.0	2	9.9	0	0.0	2	9.9
Nodes Positive	5	33.3	0	0.0	0	0.0	5	24.7	0	0.0	5	24.7
Nodes Examined	5	33.3	0	0.0	0	0.0	5	24.7	0	0.0	5	24.7
Distant Mets	3	20.0	0	0.0	0	0.0	3	14.8	0	0.0	3	14.8
Summary Stage	3	20.0	3	100.0	0	0.0	6	40.8	0	0.0	6	40.8
T Clinical	6	50.0	2	66.7	0	0.0	8	54.3	0	0.0	8	54.3
N Clinical	6	50.0	2	66.7	0	0.0	8	54.3	0	0.0	8	54.3
M Clinical	6	50.0	2	66.7	0	0.0	8	54.3	0	0.0	8	54.3
AJCC Clin Group	4	33.3	1	33.3	0	0.0	5	33.3	0	0.0	5	33.3
T Pathologic	4	66.7	1	100.0	0	0.0	5	75.3	0	0.0	5	75.3
N Pathologic	4	66.7	1	100.0	0	0.0	5	75.3	0	0.0	5	75.3
M Pathologic	4	66.7	1	100.0	0	0.0	5	75.3	0	0.0	5	75.3
AJCC Path Group	3	50.0	1	100.0	0	0.0	4	63.0	0	0.0	4	63.0

* Total percentages weighted by stratum size to reflect state total

** Denominators for fields through summary stage: 15, AJCC clinical: 12, AJCC pathologic: 16

*** Denominators for fields through AJCC clinical: 3, AJCC pathologic: 1

****Denominators for all fields: 0

Note: Data for the individual strata (high, medium, low) are not shown for the software and combined totals.

Table 5. Records with Discrepancies in Cancer and Staging Fields: Female Breast

	Coding Errors								Software Errors		Combined Errors	
	High**		Medium***		Low****		Total *		Total *		Total *	
Field	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Site	6	20.7	8	22.9	5	23.8	19	21.7	0	0.0	19	21.7
Histology	7	24.1	2	5.7	9	42.9	18	23.1	0	0.0	18	23.1
Laterality	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Grade	2	6.9	1	2.9	2	9.5	5	6.4	0	0.0	5	6.4
Dxdate	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Tumor Size	8	27.6	2	5.7	4	19.0	14	21.4	0	0.0	14	21.4
Nodes Positive	1	3.4	0	0.0	1	4.8	2	2.9	0	0.0	2	2.9
Nodes Examined	1	3.4	0	0.0	2	9.5	3	3.7	0	0.0	3	3.7
Distant Mets	1	3.4	0	0.0	0	0.0	1	2.1	0	0.0	1	2.1
Summary Stage	2	6.9	2	5.7	2	9.5	6	7.1	0	0.0	6	7.1
T Clinical	1	20.0	2	20.0	4	44.4	7	23.9	0	0.0	7	23.9
N Clinical	1	20.0	5	50.0	3	33.3	9	28.7	0	0.0	9	28.7
M Clinical	0	0.0	2	20.0	2	22.2	4	8.0	0	0.0	4	8.0
AJCC Clin Group	0	0.0	3	30.0	2	22.2	5	10.2	0	0.0	5	10.2
T Pathologic	3	12.0	3	9.4	3	16.7	9	12.2	0	0.0	9	12.2
N Pathologic	4	16.0	1	3.1	6	33.3	11	15.9	0	0.0	11	15.9
M Pathologic	2	8.0	2	6.3	0	0.0	4	6.3	0	0.0	4	6.3
AJCC Path Group	3	12.0	2	6.3	2	11.1	7	10.6	0	0.0	7	10.6

* Total percentages weighted by stratum size to reflect state total

** Denominators for fields through summary stage: 29, AJCC clinical: 5, AJCC pathologic: 25

*** Denominators for fields through summary stage: 135, AJCC clinical: 10, AJCC pathologic: 32

**** Denominators for fields through summary stage: 21, AJCC clinical: 9, AJCC pathologic: 18

Note: Data for the individual strata (high, medium, low) are not shown for the software and combined totals.

Table 6. Records with Discrepancies in Cancer and Staging Fields: Bladder

	Coding Errors								Software Errors		Combined Errors	
	High**		Medium***		Low****		Total *		Total *		Total *	
Field	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Site	13	44.8	16	41.0	14	60.9	43	46.6	0	0.0	43	46.6
Histology	2	6.9	2	5.1	3	13.0	7	7.5	0	0.0	7	7.5
Laterality	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Grade	13	46.4	20	51.3	5	21.7	38	43.5	0	0.0	38	43.5
Dxdate	1	3.4	1	2.6	0	0.0	2	2.7	0	0.0	2	2.7
Tumor Size	8	28.6	14	35.9	14	60.9	36	35.4	0	0.0	36	35.4
Nodes Positive	1	3.6	0	0.0	1	4.3	2	2.9	0	0.0	2	2.9
Nodes Examined	1	3.6	0	0.0	1	4.3	2	2.9	0	0.0	2	2.9
Distant Mets	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Summary Stage	2	7.1	4	10.3	1	4.3	7	7.4	0	0.0	7	7.4
T Clinical	11	45.8	4	11.1	15	71.4	30	42.3	0	0.0	30	42.3
N Clinical	9	37.5	12	33.3	14	66.7	35	41.3	0	0.0	35	41.3
M Clinical	9	37.5	9	25.0	13	61.9	31	38.7	0	0.0	31	38.7
AJCC Clin Group	12	50.0	5	13.9	15	71.4	32	45.5	0	0.0	32	45.5
T Pathologic	10	62.5	4	50.0	16	88.9	30	64.0	0	0.0	30	64.0
N Pathologic	5	31.3	1	12.5	6	33.3	12	27.5	0	0.0	12	27.5
M Pathologic	6	37.5	1	12.5	6	33.3	13	31.3	0	0.0	13	31.3
AJCC Path Group	9	56.3	3	37.5	16	88.9	28	57.3	0	0.0	28	57.3

* Total percentages weighted by stratum size to reflect state total

** Denominators for cancer fields - grade: 29, grade + fields through summary stage: 28, AJCC clin: 24, AJCC path: 16

*** Denominators for fields through summary stage: 39; AJCC clinical: 36; AJCC pathologic: 8

**** Denominators for fields through summary stage: 23, AJCC clinical: 21, AJCC pathologic: 18

Note: Data for the individual strata (high, medium, low) are not shown for the software and combined totals.

Table 7. Records with Discrepancies in Cancer and Staging Fields: Thyroid

	Coding Errors								Software Errors		Combined Errors	
	High**		Medium***		Low****		Total *		Total *		Total *	
Field	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Site	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Histology	12	41.4	11	36.7	3	50.0	26	41.7	0	0.0	26	41.7
Laterality	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Grade	2	6.9	4	13.3	0	0.0	6	7.2	0	0.0	6	7.2
Dxdate	0	0.0	4	13.3	0	0.0	4	2.9	0	0.0	4	2.9
Tumor Size	7	24.1	5	16.7	1	16.7	13	21.3	0	0.0	13	21.3
Nodes Positive	2	6.9	2	6.7	1	16.7	5	8.4	0	0.0	5	8.4
Nodes Examined	2	6.9	3	10.0	2	33.3	7	11.8	0	0.0	7	11.8
Distant Mets	2	6.9	2	6.7	0	0.0	4	5.7	0	0.0	4	5.7
Summary Stage	0	0.0	5	16.7	0	0.0	5	3.7	0	0.0	5	3.7
T Clinical	1	25.0	4	50.0	2	66.7	7	37.2	0	0.0	7	37.2
N Clinical	1	25.0	3	37.5	2	66.7	6	34.4	0	0.0	6	34.4
M Clinical	1	25.0	4	50.0	2	66.7	7	37.2	0	0.0	7	37.2
AJCC Clin Group	1	25.0	2	25.0	2	66.7	5	31.7	0	0.0	5	31.7
T Pathologic	1	3.4	5	17.2	1	16.7	7	8.6	0	0.0	7	8.6
N Pathologic	5	17.2	5	17.2	1	16.7	11	17.1	0	0.0	11	17.1
M Pathologic	2	6.9	3	10.3	1	16.7	6	9.2	0	0.0	6	9.2
AJCC Path Group	1	3.4	5	17.2	1	16.7	7	8.6	0	0.0	7	8.6

* Total percentages weighted by stratum size to reflect state total

** Denominators for fields through summary stage: 29, AJCC clinical: 4, AJCC pathologic: 29

*** Denominators for fields through summary stage: 30, AJCC clinical: 8, AJCC pathologic: 29

**** Denominators for fields through summary stage: 6, AJCC clinical: 3, AJCC pathologic: 6

Note: Data for the individual strata (high, medium, low) are not shown for the software and combined totals.

Table 8. Records with Discrepancies in Cancer and Staging Fields: Lymphoma

	Coding Errors								Software Errors		Combined Errors	
	High**		Medium***		Low****		Total *		Total *		Total *	
Field	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Site	8	29.6	15	37.5	10	43.5	33	33.6	0	0.0	33	33.6
Histology	2	7.4	5	12.5	3	13.0	10	9.4	0	0.0	10	9.4
Laterality	0	0.0	1	2.5	0	0.0	1	0.6	0	0.0	1	0.6
Grade	2	7.4	9	24.3	3	13.6	14	12.1	0	0.0	14	12.1
Dxdate	1	3.7	2	5.0	0	0.0	3	3.4	0	0.0	3	3.4
Tumor Size	1	3.7	3	8.1	9	40.9	13	10.6	0	0.0	13	10.6
Nodes Positive	1	3.7	5	13.5	10	45.5	16	12.5	0	0.0	16	12.5
Nodes Examined	1	3.7	5	13.5	10	45.5	16	12.5	0	0.0	16	12.5
Distant Mets	0	0.0	1	2.7	2	9.1	3	2.0	0	0.0	3	2.0
Summary Stage	10	37.0	3	8.1	6	27.3	19	29.1	0	0.0	19	29.1
T Clinical	9	52.9	9	27.3	13	81.3	31	51.8	0	0.0	31	51.8
N Clinical	9	52.9	9	27.3	13	81.3	31	51.8	0	0.0	31	51.8
M Clinical	9	52.9	9	27.3	13	81.3	31	51.8	0	0.0	31	51.8
AJCC Clin Group	13	76.5	13	39.4	11	68.8	37	67.1	0	0.0	37	67.1
T Pathologic	15	68.2	14	50.0	14	82.4	43	66.4	0	0.0	43	66.4
N Pathologic	15	68.2	14	50.0	14	82.4	43	66.4	0	0.0	43	66.4
M Pathologic	15	68.2	14	50.0	14	82.4	43	66.4	0	0.0	43	66.4
AJCC Path Group	18	81.8	22	78.6	16	94.1	56	83.1	0	0.0	56	83.1

* Total percentages weighted by stratum size to reflect state total

** Denominators for fields through summary stage: 27, AJCC clinical: 17, AJCC pathologic: 22

*** Denominators for cancer fields - grade: 40, grade+ fields through summary stage: 37, AJCC clin: 33, AJCC path: 28

**** Denominators for cancer fields - grade: 23, grade+ fields through summary stage: 22, AJCC clin: 16, AJCC path: 17

Note: Data for the individual strata (high, medium, low) are not shown for the software and combined totals.

Table 9. Records with Discrepancies in Treatment Fields

	Coding Errors								Software Errors		Combined Errors	
	High**		Medium***		Low****		Total *		Total *		Total *	
Field	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Surgery	45	28.8	48	26.2	20	24.4	113	27.6	1	0.4	114	28.0
Scope of Nodes	34	21.8	41	22.4	16	19.5	91	21.6	0	0.0	91	21.6
Regional Nodes	30	19.2	28	15.3	13	15.9	71	17.8	0	0.0	71	17.8
Surgery, Other Sites	8	5.1	6	3.3	1	1.2	15	4.1	0	0.0	15	4.1
Surgery Date	26	16.7	17	9.3	10	12.2	53	14.3	0	0.0	53	14.3
Reason No Surgery	33	21.2	21	11.5	10	12.2	64	17.6	0	0.0	64	17.6
Radiation	9	5.8	7	3.8	8	9.8	24	6.0	3	0.4	27	6.3
Radiation Date	10	6.4	9	4.9	10	12.2	29	7.0	0	0.0	29	7.0
Reason No Radiation	50	32.1	15	8.2	8	9.8	73	23.2	0	0.0	73	23.2
Surg/Rad Sequence	23	14.7	8	4.4	6	7.3	37	11.3	0	0.0	37	11.3
Chemotherapy	12	7.7	5	2.7	4	4.9	21	6.2	0	0.0	21	6.2
Chemotherapy Date	17	10.9	8	4.4	18	22.0	43	11.2	0	0.0	43	11.2
Reason No Chemo	53	34.0	15	8.2	11	13.4	79	25.0	0	0.0	79	25.0
Hormone TX	22	14.1	21	11.5	17	20.7	60	14.6	0	0.0	60	14.6
Hormone TX Date	32	20.5	28	15.3	23	28.0	83	20.6	0	0.0	83	20.6
Reason No Hormone TX	57	36.5	50	27.3	23	28.0	130	33.2	0	0.0	130	33.2
BRM	2	1.3	6	3.3	15	18.3	23	4.4	0	0.0	23	4.4
BRM TX Date	2	1.3	8	4.4	15	18.3	25	4.7	0	0.0	25	4.7
Other TX	3	1.9	0	0.0	0	0.0	3	1.2	0	0.0	3	1.2
Other TX Date	3	1.9	0	0.0	0	0.0	3	1.2	0	0.0	3	1.2
TX Start Date	38	24.4	20	10.9	14	17.1	72	20.2	0	0.0	72	20.2

* Total percentages weighted by stratum size to reflect state total

** Denominators for all fields: 156

*** Denominators for all fields: 183

**** Denominators for all fields: 82

Note: Data for the individual strata (high, medium, low) are not shown for the software and combined totals.

Table 10. Major Discrepancies by Primary Site*

Variable	Head and Neck	Mesothelioma	Breast	Bladder	Thyroid	Lymphoma
Site	12 (27)	0 (1)	0 (19)	0 (43)	0 (0)	14 (33)
Histology	3 (8)	1 (6)	17 (18)	7 (7)	25 (26)	8 (10)
Diagnosis Date	2 (4)	0 (0)	0 (0)	2 (2)	1 (4)	1(3)
Summary Stage	12 (16)	6 (6)	3 (6)	7 (7)	3 (5)	16 (19)
AJCC Clinical Stage	17 (18)	5 (5)	5 (5)	30 (32)	5 (5)	23 (37)
Clin/Path Discrepancies**	13	3	2	23	5	12
AJCC Pathologic Stage	23 (24)	2 (4)	7 (7)	28 (28)	7 (7)	40 (56)
Clin/Path Discrepancies***	17	2	2	25	2	30

* Number of major discrepancies in all records (Number of total discrepancies in all records)
**Number of major discrepancies in AJCC clinical stage assigned to clinical/pathologic criteria issues
***Number of major discrepancies in AJCC pathologic stage assigned to clinical/pathologic criteria issues

Table 11. Frequency of Combinations of Clinical and Pathologic Staging Elements

Stage Grouping	Head and Neck	Mesothelioma	Breast	Bladder	Thyroid	Lymphoma
Single Stage Grouping Reported						
cTcNcM, c stage	12	7	2	54		
cTcNpM, c stage	2	1				
cTpNcM, c stage	4	3				
pTcNcM, c stage	9		4		3	
pTpNcM, c stage	2		3			
pTpNpM, c stage	2	1				
c stage						30
cTcNcM, p stage				10 (N0M0)		
cTpNcM, p stage	1			4 (NXM0)		
cTpNpM, p stage				10 (NXMX)	1	
pTcNcM, p stage	15	2	5		30	
pTpNcM, p stage	24	1	60	9	22	
pTpNpM, p stage	2				2	
p stage						36
Both Clinical and Pathologic Stage Groupings Reported						
c stage, p99	1		1			
c99, p stage			1			
c stage, p stage	5		7	2	7	22
No Staging			2	2		2
Stage NA		3				

Table 12. Coding Agreement in Data Fields 1995-2002 Reabstracting Studies

	Diagnosis Year						
Variables/Primary Site*	**1995**	**1996**	**1997**	**1998**	**2000**	**2001**	**2002**
Demographics							
M = 2970							
All fields	96.7	98.0	98.0	97.6	98.8	98.6	99.0
Treatment							
M = 2940							
All Fields [Coding]	94.1	95.8	94.2	91.7	95.0	94.5	86.0
All Fields [Software]	84.4	98.0	99.3	99.1	99.3	99.9	100.0
Head and Neck							
M = 218							
Cancer Fields	93.4			90.1			68.3
All Staging Fields	82.1			76.3			72.0
Summary Stage	94.3			84.8			77.4
Esophagus							
M = 105							
Cancer Fields		91.3				91.5	
All Staging Fields		77.4				81.4	
Summary Stage		77.9				74.5	
Colorectal							
M = 187							
Cancer Fields			97.3	93.4			
All Staging Fields			85.1	85.5			
Summary Stage			79.1	82.3			
Liver							
M = 25							
Cancer Fields						96.6	
All Staging Fields						71.8	
Summary Stage						75.1	
Lung							
M = 213							
Cancer Fields			94.2		88.3		
All Staging Fields			76.9		75.7		
Summary Stage			71.9		84.3		
Mesothelioma							
M = 18							
Cancer Fields							88.9
All Staging Fields							60.6
Summary Stage							59.2

Table 12. Coding Agreement in Data Fields 1995-2002 Reabstracting Studies (continued)

	Diagnosis Year						
Variables/Primary Site	**1995**	**1996**	**1997**	**1998**	**2000**	**2001**	**2002**
Melanoma of Skin							
M = 164							
Cancer Fields			92.8		94.2		
All Staging Fields			75.9		84.7		
Summary Stage			89.2		97.2		
Soft Tissue Sarcoma							
M = 23							
Cancer Fields					81.4		
All Staging Fields					79.2		
Summary Stage					75.3		
Female Breast							
M = 670							
Cancer Fields	92.2	90.5	90.1	90.3	93.3	88.3	89.8
All Staging Fields	91.3	88.6	83.6	88.5	89.0	89.8	89.8
Summary Stage	94.5	94.3	92.5	96.2	93.6	98.6	92.9
Cervix Uteri							
M = 50							
Cancer Fields				90.0			
All Staging Fields				74.4			
Summary Stage				85.8			
Corpus Uteri							
M = 166							
Cancer Fields	96.9				91.1		
All Staging Fields	89.1				85.2		
Summary Stage	90.5				91.0		
Ovary							
M = 123							
Cancer Fields		91.2				85.5	
All Staging Fields		77.9				73.5	
Summary Stage		71.5				76.5	
Prostate							
M = 199							
Cancer Fields			96.6			97.5	
All Staging Fields			85.2			87.3	
Summary Stage			96.9			96.6	

Table 12. Coding Agreement in Data Fields 1995-2002 Reabstracting Studies (continued)

	Diagnosis Year						
Variables/Primary Site	**1995**	**1996**	**1997**	**1998**	**2000**	**2001**	**2002**
Testis							
M = 89							
Cancer Fields		97.4			85.6		
All Staging Fields		75.5			65.9		
Summary Stage		83.1			84.3		
Kidney							
M = 142							
Cancer Fields		90.0				80.9	
All Staging Fields		81.1				88.7	
Summary Stage		83.1				94.0	
Bladder							
M = 251							
Cancer Fields	82.6			85.3			80.1
All Staging Fields	80.7			82.4			72.5
Summary Stage	74.7			90.1			92.6
Thyroid							
M= 65							
Cancer Fields							89.6
All Staging Fields							86.8
Summary Stage							96.3
Lymphoma							
M = 258							
Cancer Fields	87.0			88.5			88.2
All Staging Fields	84.8			51.5			59.5
Summary Stage	64.2			74.8			70.9

* N records = total across all years displayed

Figure 1. Percent Agreement in Coding Demographic and Treatment Fields by Facility Stratum

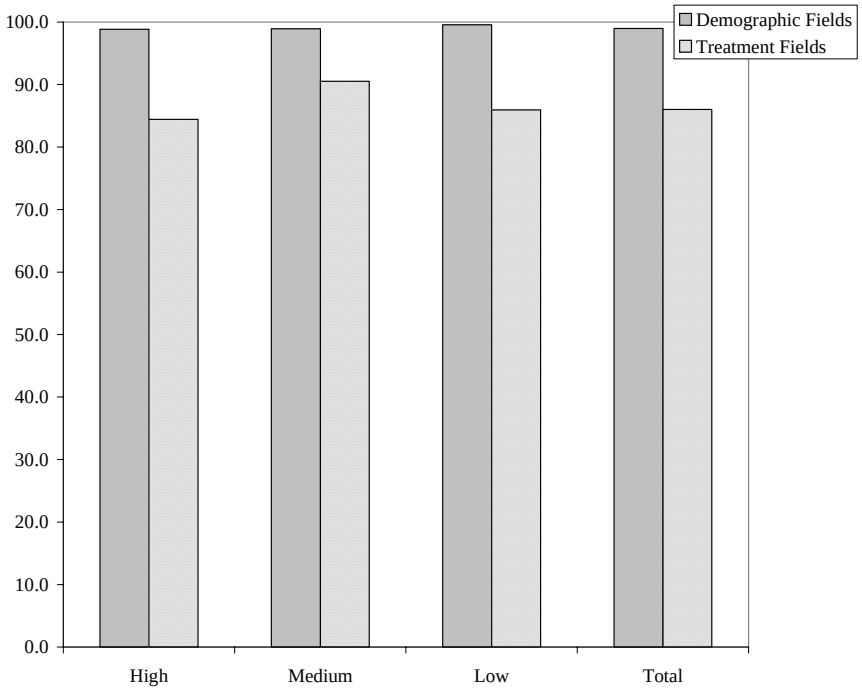


Figure 2. Percent Agreement in Coding Cancer and Staging Fields by Primary Site

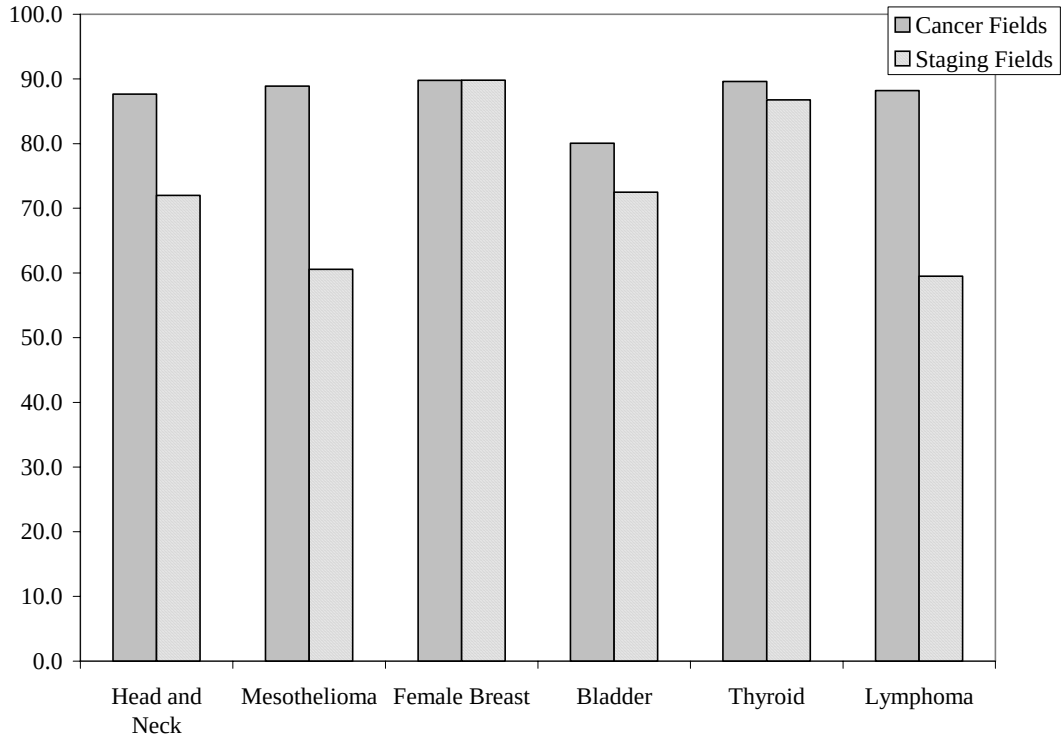


Figure 3. Number of Coding and Software Errors by Demographic and Treatment Fields

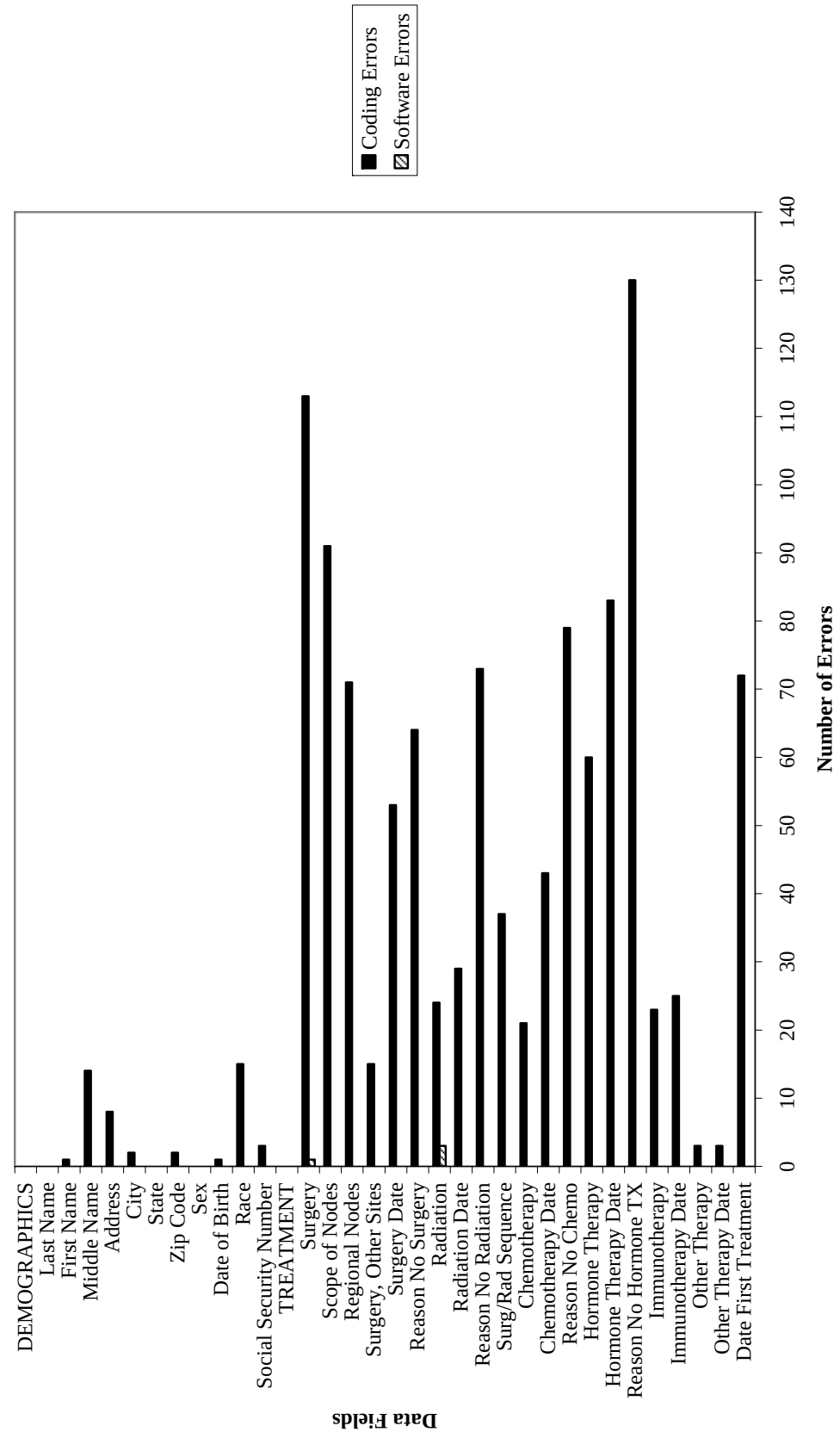
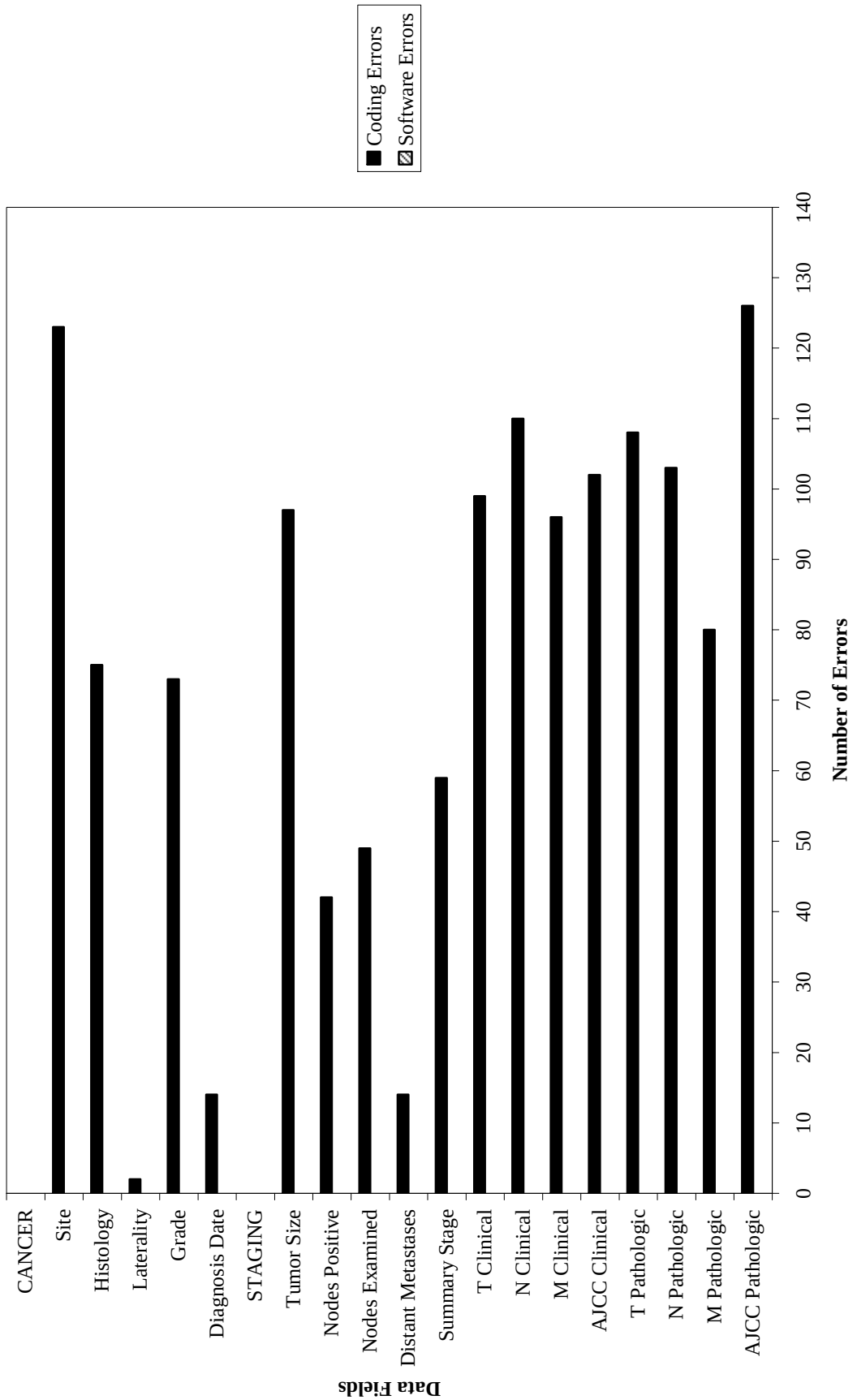


Figure 4. Number of Coding and Software Errors by Cancer and Staging Fields



REFERENCES

1. Hutchison CL, Menck HR, Burch M and Gottschalk R (eds.) *Cancer Registry Management: Principles and Practice*, 2nd Edition. National Cancer Registrars Association, 2004, pp. 202-4.

2. Menck H and Smart C (eds.). *Central Cancer Registries: Design, Management, and Use*. Harwood Academic Publishers, 1994, p. 153.

3. Collins EN, Braun JE, and Punyko JA. *Evaluation of Abstracting: Cancers Diagnosed in 1997*. MCSS Quality Control Report 2000:1.

4. Collins EN, Braun JE, and Soler J. *Evaluation of Abstracting: Cancers Diagnosed in 2000*. MCSS Quality Control Report 2005:1.

5. Fritz A, Percy C, Jack A, Shanmugaratnam K, Sobin L, Parkin D, and Whelan S (eds.). *International Classification of Diseases for Oncology*, 3rd Edition. World Health Organization, 2000.

6. Percy, C, Van Holten V and Muir C (eds.). *International Classification of Diseases for Oncology*, 2nd Edition. World Health Organization, 1990.

7. "Coding Complex Morphologic Diagnoses", SEER training Materials, revised August 2002..

8. Commission on Cancer. *Registry Operations and Data Standards*. American College of Surgeons, 1996, Revised 1/1/98, p. 112.

9. Commission on Cancer. *Registry Operations and Data Standards*. American College of Surgeons, 1996, Revised 1/1/98, p. 101.

10. Commission on Cancer. *Registry Operations and Data Standards*. American College of Surgeons, 1996, Revised 1/1/98, p. D-cxl. Fleming ID, Cooper JS, Henson DE, Hutter, RBP, Kennedy BJ, Murphy GP, O'Sullivan B, Sobin LH, and Yarbro JW (eds). *AJCC Cancer Staging Manual*, 5th Edition. American Joint Committee on Cancer, 1997, p. 59.

11. Green FL, Page, D, Fleming ID, Fritz AG, Balch CM, Haller, DG and Morrow M (eds). *AJCC Cancer Staging Manual*, 6th Edition. American Joint Committee on Cancer, 2002.

12. Collaborative Staging Task Force of the American Joint Committee on Cancer *Collaborative Staging Manual and Coding Instructions*. National Cancer Institute, NIH Pub. No. 04-5496, 2004.