# Coverage Studies Evaluation Using Demographic Estimates

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# 1. Introduction

· The current document presents an evaluation of the results of the 1996 Census coverage studies, as scheduled for release March 27th, 1998. Of primary interest to Demography Division is the extent to which estimates of coverage error appear plausible, in light of Statistics Canada's post-censal estimates program.

In the current report, estimates of gross undercount, gross overcount, and net undercount are presented, for Canada and the provinces/territories. In establishing what are conceptually consistent figures, the results from all of the coverage studies in 1991 and 1996 will be considered, including figures on "missed persons" that have already been directly added to the Census data base in the form of "random additions" (i.e. the Vacancy Check Study in 1991 and 1996 and the Temporary Residents Study only in 1991). In addition, since partially or incompletely enumerated Indian Reserves have been estimated separately from the Coverage Measurement program in 1996, it is necessary to specifically address these estimates in making comparisons over time. The resultant population figures will be subsequently compared with post-censal estimates as prepared by Demography Division (both in terms of population totals and age/sex distribution). The difference between the two sets of figures (i.e. the error of closure) provides Demography Division with an indication as to the precision of post-censal estimates. This will be followed by a summary discussion of those factors responsible for the observed closure errors, at both the national and provincial level.

As a matter of introduction, it is emphasized that "coverage error" has declined significantly in 1996. Overall, census collection appears to have been more successful, across most provinces and territories. At the same time, the difference between the 1996 Census adjusted for coverage error and the most up to date post-censal estimate by Demography Division is up from the previous intercensal period. In explanation of this latter phenomenon, i.e. a larger closure error, several factors have been raised, including (i) methodological enhancements in the documentation of "missed" in the Reverse Record Check (RRC) - which has demonstrated that the 1991 estimate of "missed" was too high, (ii) the development of new automated matching techniques that improve on the documentation of "overcount" - which indicate that the 1991 estimate of "double counting" was too low, and (iii) increased uncertainty

in the estimation of selected demographic components that relate to Demography Division's post-censal estimates - particularly with respect to "emigration", "returning Canadians" and the temporarily "abroad"[1]. Other factors that influence closure error, but would not explain why it should increase over time include (i) sampling error in the 1991 Coverage Studies - that enters into the baseline population of the post-censal estimates, and (ii) sampling error in the 1996 coverage studies. Overall, while the Reverse Record Check (and related studies) have apparently improved upon the documentation of net undercount in 1996, the unfortunate by product is increased intercensal inconsistency in our population figures. More specifically, closure error may be up merely due to problems now obvious in the 1991 adjustment. This leaves open the question as to whether Demography Division should consider a revision of the 1991 adjustment, in light of this evidence.

# 2. National, Provincial/Territorial Estimates

## 2.1 Coverage Study Results: Total Population

Table 1 presents estimated net undercount, by province/territory, as recorded in 1991 and 1996. In 1996, estimated net undercount (at 2.57%) at the national level is down from 1991, by about a quarter of a percentage point (from about 2.82%)[2]. More specifically, estimated undercount is found to be at an even lower level than in 1986 (when it was estimated at about 2.68%.[3] This breaks from a long term upward trend in undercount that has characterized the

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[1] The "abroad" are Canadian citizens (or landed immigrants) living outside Canada temporarily, without a usual place of residence in Canada. They differ from emigrants, as emigrants are typically associated with an intended permanent move. As will be demonstrated, since this mobility is not explicitly part of Statistics Canada's population estimates program, an increase in the number living abroad can have an impact on closure error.

[2] The original estimate of net undercount by the Coverage Studies was at 2.87% in 1991. Slight revisions were introduced by Demography Division in their final set of undercount adjustments, leaving total net undercount at 2.82%.

[3] As overcoverage was estimated for the first time in the 1991 Overcoverage study, estimates of net undercount prior to this point in time were obtained by using information on gross undercount as documented in previous censuses and ratios (by age and sex) of gross undercount to gross overcount as documented in 1991. More specifically, it was assumed that

1971-1991 period.[4]

It is noteworthy that not all of the results from the coverage studies are typically incorporated in official estimates of net undercount (i.e. results that lead to the direct adjustment of the census base in the form of "random additions" are typically excluded). Consistent with past practice, data on net undercount as published by Statistics Canada typically excludes coverage error that is added to the census base in the form of "random additions", as this coverage error has already been adjusted for in the first published census data. For example, the results from the 1991 Vacancy Check Study and 1991 Temporary Residents Study was directly added to the 1991 census database in the form of "random additions", just as the results of the 1996 Vacancy Check Study was added directly to the 1996 Census data base (with the Temporary Residents Study being canceled in 1996). In addition, for the first time in 1996, estimates of persons missed due to their residence in "incompletely or partially enumerated Indian Reserves" were obtained, independent of the RRC and related coverage studies. As the estimated net undercount for these reserves were formally integrated in previous estimates of net undercount yet excluded in the 1996 RRC, this change in procedure also needs to be considered in generating conceptually consistent figures for comparative purposes.

Table 2 presents alternative estimates of total net undercount, in both 1991 and 1996, by incorporating all estimates of coverage error irrespective of how they are used in the adjustment of census data. More specifically, in 1991 total net undercount (including "random additions") was fully 3.60% (in contrast to about 2.82% when excluding random additions). In 1996, total net undercount (including "random additions" and the independently derived estimates of relevant Indian reserves) was fully 3.01% (in contrast to about 2.57% when excluding these two sources of coverage error). Overall, estimated coverage error declined by an even greater extent than implied initially, with a decrease of .59% in contrast to about .25%.[5]

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these ratios as observed in 1991 were constant as we moved back in time.

[4] An exception to this generalization occurred in 1981, whereas estimated undercount was found to have decreased slightly from 1976, only to again increase substantially in 1986.

[5] In addition to random additions, a further adjustment for a type of coverage error is formally incorporated in census processing, i.e. the completion of "Form 4's". In census collection, enumerators are instructed to complete what are referred to as "Form 4's" if a dwelling is occupied but after repeated visits, no census forms can be completed. The characteristics of all occupants are subsequently imputed at a much later stage of census processing, often without

In explanation as to why coverage error might have declined in 1996, two factors have been raised by methodologists working on census collection. Firstly, Census day was shifted to May 14th from the 2nd of June, with the specific intention of improving coverage. The rational in so doing is that this would assist in enumerating "end of month" movers, increase the number of households contacted, and assist in the follow-up on non-response (as logically enumerators will be more successful in locating persons at home - Canadians are less likely to be visiting relatives or away from home on May 14th than in early June). Secondly, Statistics Canada reallocated resources in census collection in 1996, in an effort to improve enumeration in selected enumeration areas in core city areas of Montreal, Toronto and Vancouver (through increased training and the use of interviewers), in recognition that selected neighborhoods had particularly high non-response rates in 1991. The coverage errors as documented through the Statistics Canada's coverage measurement program would tend to suggest some success with these changes in census operations.

As will be elaborated upon in the "discussion" section of the current report, there is also evidence to suggest that part of this shift in net undercount in 1991 and 1996 might be explained in terms of improvements in the methodologies of the coverage studies themselves (i.e. is an artifact of how we measure coverage error irrespective of how coverage error might have shifted in reality over the previous two censuses). More specifically, there is evidence to suggest an overstatement of gross undercount and an understatement of gross overcount in 1991. Particularly important in this context is the development of new matching techniques which has decisively demonstrated that some persons declared "missed" in the 1991 RRC were in actual fact "enumerated" in 1991. In addition, the use of the RRC to measure part of overcoverage in 1996 along with the development of new automated matching procedures in the measurement of overcoverage (i.e. innovations in systematically searching across households across enumeration areas) suggests that the 1991 Overcoverage Study might have seriously understated overcoverage - which directly translates into an overstatement of net undercount.

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even information on the actual number of occupants in the dwelling. In a sense, this could be thought of as a type of adjustment for coverage error, specifically dealt with through hot deck procedures in census imputation. It is interesting to note that in 1996, the number of persons added to the census base through "Form 4's" was down considerably from 1991 (by over 100,000 persons). This suggests even further improvement in terms of census operations and the collection of information from the Canadian public.

When considering all sources of coverage error (again, in reference to Table 2), British Columbia witnessed the greatest increase in coverage error in 1996, whereas Alberta and Saskatchewan witnessed more modest increases. In 1996, it is noteworthy that net undercount is estimated to be highest among provinces in British Columbia, up from 1991 by .85%.[6] On the other hand, across nearly all other provinces/territories, the decline as observed nationally was also observed provincially/territorially. Across provinces, this decline was particularly pronounced in New Brunswick, Quebec and Ontario (with this generalization true, irrespective of whether or not we explicitly include "random additions" in our comparison), followed by moderate decreases in Newfoundland, Manitoba and P.E.I . Interestingly, while net undercount (excluding random additions) implied a significant climb in Saskatchewan (as indicated in Table 1), a more complete portrait of coverage error (including random additions) suggests only a negligible increase. In Canada's north (Yukon and the NWT) the combined coverage error as implied by all of the coverage studies suggests a significant improvement in census coverage in 1996 (although it remains very high, comparable only to British Columbia). In Nova Scotia, estimated coverage error remains virtually unchanged (when considering all sources of error together). Overall, in comparing Table 1 with Table 2, across all provinces/territories, either the decline in undercount rates was more pronounced in the latter, or the estimated increase in undercount is somewhat lower.[7]

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[6] Two factors enter into explaining this increase in coverage error in British Columbia in 1996. Firstly, British Columbia had declared a provincial election in spring of 1996 which may have interfered to a limited extent in the census publicity campaign and in the successful enumeration of the province (for example, in losing experienced enumerators to the provincial election campaign and electoral enumeration). Secondly, in contrast to 1991, British Columbia lost a useful resource in the identification and listing of dwellings, i.e. Statistics Canada did not have access to the Extended Address Register in implementation of the 1996 Census - in contrast to 1991.

[7] In further examining the provincial pattern of net undercount, it is interesting to consider net undercount in the CMAs of Toronto, Montreal and Vancouver (the RRC does not produce reliable estimates for smaller census metropolitan areas due to sample size). In line with the substantial drop in net undercount for the province of Ontario, Toronto witnessed a decline in net undercount, from 4.03% to 3.65%. In line with the sizeable increase in net undercount in British Columbia, Vancouver witnessed an increase in net undercount from 2.62% to 4.23%. In line with the sizeable drop in net undercount in the province of Quebec, Montreal witnessed a decline in net undercount from 2.4% to 1.77%. Over the 1991-1996 period, the three largest CMAs in Canada all have witnessed change in net undercount that is consistent with the provincial pattern. These improvements are also consistent with the aforementioned effort to improve enumeration in selected inner city neighborhoods of larger Canadian cities.

Under closer inspection, it is useful to further breakdown observed changes in terms of gross undercount, gross overcount, random additions, and the combined impact of all such errors. Table 3 presents this breakdown of relevant rates, as well as differences observed for these rates over the 1991-1996 period, both nationally and at the provincial/territorial level. Overall, it is noteworthy that at the national level, the estimated gross undercount rate declined only slightly across the two censuses (from 3.38% to 3.33%), whereas estimated gross overcoverage rates increased by a greater amount (from .56% in 1991 to .76% in 1996). In setting aside the impact of "random additions", the observed decline in net undercount (with a decline of .25 percent) is therefore more so the by-product of increased gross overcoverage rather than gross undercount. On the other hand, if we consider the impact of all coverage studies - including the undercount as added to the census in the form of random additions/partially completed Indian reserves - the relative importance of overcoverage in explaining this shift in coverage error declines. Again, the decrease in total net undercount (including random additions and Indian reserves) is fully .59%, whereas about .20 percent of this decline is due to increased overcount.[8]

At the provincial/territorial level, estimated change in the level of gross undercount varies considerably, as for example, gross undercount rates decreased substantially in New Brunswick, Ontario and Quebec (with a decline of 1.18%, .58% and .57%, respectively). On the other hand, gross undercount rates actually increased substantially in both British Columbia and Saskatchewan (by 1.48% and 1.25%). With respect to estimated gross overcoverage, across all provinces and territories, this rate increased significantly - while again showing considerable variation across provinces (for example, estimated overcoverage almost doubled in Manitoba while remaining relatively stable in both Ontario and Alberta). With respect to the impact of "random additions", it is noteworthy that across Canada its relative contribution was reduced by well over one half (with the sole exception of the Yukon). In partial explanation of this variation by province, in the impact of undercount, overcount and random additions, many of these differences across provinces/territories likely lie with sampling error, in both 1991 and 1996.[9]

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[8] Again, in recognition of the aforementioned overstatement of net undercount in 1991, part of the overall decline is due to methodological enhancements introduced in estimating coverage error in 1996.

[9] To provide some information on the relative impact of sampling error in this context, across provinces the standard errors on estimated net undercount varied from a low of .2% in Ontario and Quebec through to a high of .34 in Saskatchewan.

It is a combination of these changes that lead to particularly pronounced changes for specific provinces in total coverage error. For example, with New Brunswick and Quebec, the substantial decline in total coverage error can be explained as a by-product of three factors (i) a significant decline in gross undercount (particularly in New Brunswick), a significant increase in gross overcount (particularly in Quebec) and a large drop in the number of "random additions" (in both provinces). For other provinces that have experienced relative stability in terms of coverage error, it should be recognized that this does not necessarily imply a stability with respect to the nature of this coverage error (for example, in Saskatchewan - with only a slight increase in coverage error overall - gross undercount went up sharply, gross overcoverage went up significantly, and random additions went down sharply. Beyond the aforementioned sampling error, it is clearly a very complex issue as to why there should be such variability over time in terms of overcount or undercount in census collection. As mentioned previously, part of the observed change is likely due to improvement in census collection, and part of the shift is due to innovations in terms of the measurement of net undercount.

Briefly, Table 4 provides further details on random additions in 1991 and 1996. In 1991, 126,818 persons were added to the census base in through the Vacancy Check, whereas an additional 92,584 persons were added through the Temporary Residents Study. In 1996, only 87,704 persons were added through the Vacancy Check (down by about a third from the 1991 Vacancy Check), whereas the Temporary Residents Study was canceled. Consequently, although the numbers are very small, the comparisons on the Vacancy Check Studies imply that the Census was more successful in identifying occupied dwellings in 1996. This improvement in the Vacancy Check is further evidence as to the "Census Day" effect, in shifting the date of the enumeration from June 2nd to May 14th. The cancellation of the Temporary Residents Study, in and of itself, was expected to lead to an increase in estimated gross undercoverage as documented through the remaining coverage studies. This increase was not observed in Table 3 - as again, gross undercount actually declined by a negligible amount.

## 2.2 Coverage Study Results Relative to Post-Censal Estimates, by Province/Territory

In evaluation of the 1996 Coverage Studies, a useful exercise is to systematically compare Census results after adjustment for coverage error with population estimates available as part of

Statistics Canada's regular program of post-censal estimates. For the current report, the most up to date estimate of Canada's population as of Census day 1996 is generated (using components as available in February 1998) with a corresponding breakdown by province/territory. In producing these population estimates, the post-censal program is reliant on the previous census (adjusted by the 1991 coverage studies) and all relevant components of demographic change over the 1991-1996 period (deaths, births, immigrants, emigrants, returning Canadians, net flow in non-permanent residents, and at the provincial/territorial level - interprovincial migration). Subsequent discrepancies as observed between the adjusted census figures and post-censal estimates suggest problems in either of the two data sets, or perhaps more realistically, in both data sets.

Table 5 presents 1996 Census figures after adjustment for preliminary results from the 1996 coverage studies, post-censal estimates of population (Census day, 1996) as well as the respective "closure errors" as obtained in comparing the two sets of figures. The 1996 Census numbers are adjusted by preliminary estimates of net undercount and independent estimates of incompletely or partially enumerated Indian Reserves. By adding the net undercount to the 1996 published Census figures, along with independent estimates of incompletely or partially enumerated Indian Reserves, Canada's Census day population, fully adjusted for coverage error is estimated at: 29,650,683. This figure is appreciably lower than the Census day estimate generated by Demography Division (29,909,099 persons). This difference between the post-censal estimate (which uses the 1991 Census, adjusted by the 1991 Coverage studies as its baseline population) is .87% (258,416 persons).

In considering the provincial/territorial breakdown, it is noteworthy that estimated closure error is high for Canada's eastern most province (at 1.58% in Newfoundland) and its three largest provinces (i.e. the closure error is 1.66% in Quebec, 1.38% in Ontario, and -1.24% in British Columbia). This level of closure error, both nationally and for selected regions of the country, was not anticipated by Demography Division. On the other hand, closure error is found to be very low in Canada's three prairie provinces (at .20% in Manitoba, -.22% in Saskatchewan, and .21 in Alberta). The higher closure error as observed for Canada's north is not surprising (at -2.08% in Yukon and -1.26% in NWT) given the difficulties in obtaining precision when dealing with small numbers.

Table 6 presents the closure error as observed for the total Canadian population as

associated with the most up to date time series produced by Demography Division for the period 1971-1991. As is obvious in comparing these closure errors, the discrepancy as observed in 1996 is high relative to those inherent in this series. With the population figures corresponding to the last two decades (1971-1991), closure error declines - a trend which is disrupted with the 1991-1996 period. In 1996, the reported closure error is almost twice as high as any closure error for the 1971-1991 period (at 258,416 persons versus a high of 134,465 in 1971-1976). At the same time, it is recognized that this series corresponds to population figures generated relatively recently (Statistics Canada, 1994) and is a revised series generated with adjustments for estimated coverage error back to 1971 (among other revisions). A review of the figures previously published by Statistics Canada over past decades demonstrate that the 1996 closure error is actually smaller than the original closure error provided to the provincial focal points with the 1986 Census. The 1986 closure error was .94% (Statistics Canada, 1988:35), which compares to a closure error of .87% in 1996.

For comparative purposes, Table 7 includes the estimated error of closure in both 1991 and 1996, as observed nationally and by province/territory. In this context, it is noteworthy that estimated closure error worsened to a larger extent in Canada's three largest provinces (with closure error increasing from .10% to 1.66% in Quebec, from -.06% to 1.38% in Ontario, and from .22% to -1.24% in British Columbia). As the error of closure is larger nationally in 1996, six out of ten provinces witnessed an increase in closure error. On the other hand, PEI, Saskatchewan, Manitoba, Alberta and the territories all witnessed significant improvements in their reported closure error.

While the correspondence between post-censal estimates and the adjusted census figures are reason for encouragement across the prairie provinces, the closure error observed for Canada's three largest provinces explains the closure error as documented nationally. The methodology applied by Demography Division in estimating intercensal change, both nationally and for the provinces, is largely consistent across provinces and did not change appreciably in moving from one intercensal period to another - leaving it unclear as to why Demography Division's estimates should have worsened over the recent intercensal period. Yet as previously indicated, part of the shift observed in net undercount relates to improvements in the coverage study methodologies themselves, and consequently enters into the explanation as to why the error of closure increased in 1996. Again, the development of new matching techniques indicates that the number of persons classified as missed in 1991 was too high (an error which inflates the base

population which underlies the post-censal estimates) whereas methodological innovations in the measurement of overcoverage indicate that the 1991 estimate is understated (which again translates into an inflated base). Both of these changes directly contribute to increased closure error, as they inflated the 1991 baseline population and the corresponding post-censal estimate.

## 2.3 National Population Growth, 1991-1996

Table 8 presents summary data on the components of demographic growth (1971-1996) as well as total growth in population estimated alternately as (i) the sum of these components, and (ii) the difference in census counts, at the beginning and end of each intercensal period, after adjustment for coverage error. Total births for each intercensal period are presented, as are total deaths (and corresponding natural increase: births - deaths). Total immigrants, emigrants, returning Canadians and net flow in non-permanent residents (NPR's) are presented (with the corresponding balance, net international migration). Non-surprising, with a large positive closure error in 1996, the growth as estimated by Demography Division over the period 1991-1996 is higher than the growth suggested in comparing the adjusted census data. The fact that the difference between the two alternate estimates of intercensal growth is larger for the 1991-1996 period relative to earlier intercensal periods was not anticipated by Demography Division, as the methodology applied by Demography Division in estimating intercensal change has not changed significantly over the last several intercensal periods.

At the national level, data on "natural increase" (columns 1-3) as compiled by Health Statistics Division is considered to be of very high quality, with no reason to believe that its quality should have declined recently. With immigration (column 4), Citizenship and Immigration Canada (CIC) closely documents all visas and records of landing, subject to close surveillance by the government of Canada (with no reason to suggest that the quality of these figures should decline). With non-permanent residents (column 7), Citizenship and Immigration Canada keeps careful records on the number of permit holders, with evidence to suggest that recent estimates of NPR's have only increased in accuracy.[10] With the two remaining

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[10] If all figures on NPR's are removed from Demography Division's estimate of intercensal change, as well as from the 1991 and 1996 census figures (i.e. NPR's enumerated in the 1991 and 1996 censuses and estimated "missed NPR's" as documented in the Coverage Studies), the net effect on the reported closure error is to increase the discrepancy observed (increasing the error of closure by 29,581 persons, up to 287,993).

components - i.e. emigration (column 5) and returning Canadians (column 6), the uncertainty in the estimation is admittedly higher, although both would have to be seriously in error to explain the sorts of closure errors as observed in 1996.

As a result of ongoing research on the uncertainty of demographic components, it has been suggested that the combined impact of error in emigration and return migration might be to reduce at the national level, the closure error by - at the most - about 100,000. Recent work using indirect estimation techniques suggest that emigration over the 1991-1996 period might have been understated (Morissette, 1998) whereas exploratory work with Revenue Canada Taxation (RCT) data also suggests the possibility of an overstatement in terms of returning Canadians. If for example Demography Division understates emigration (by for example, about 25%) while Demography Division's estimate of returning Canadians is off by 50%, (i.e. an overstatement), the combined impact of both sources of error would explain less than half the initial closure error. This scenario can be taken as an extreme as to the uncertainty in these two components.

## 2.4. Provincial/Territorial Population Growth

Table 9 presents summary data on the components of demographic growth, by province/territory, as estimated over the 1991-1996 intercensal period. In addition, this table again includes two alternate estimates of total growth, estimated at the provincial/territorial level, as either (i) the growth as estimated by Demography Division's post-censal estimates program (column 10), or (ii) the differences observed between the censuses, after adjustment for coverage error (column 11). Again, for several provinces, there are closure errors that need be explained, in terms of both the uncertainty in the components that underlie the post-censal estimates and in the results from the coverage studies themselves. An evaluation of provincial closure errors relative to what is known of the impact of specific components, leaves for several examples of discrepancies that are difficult to explain in terms of the data compiled by Demography Division.

As three out of the four provinces with the largest closure errors also happen to be the three largest provinces in terms of population size - i.e. Quebec (at 1.66%), Ontario (at 1.38%) and British Columbia (at -1.24%), it appears appropriate to at least briefly consider in greater

detail possible factors responsible for such error.[11]  Beginning with Quebec, the total growth observed for this province over the intercensal period (i.e. the summation of all relevant components) was 315,679 persons, whereas the adjusted census figures implied a growth of only 194,658 persons - for a closure error of 121,021, or 1.66%).   In further examining the relative contribution of specific components to this increase, it is noteworthy that both natural increase (births - deaths: 200,674 persons) and immigration (190,289 persons) explain the bulk of the growth documented by Demography, whereas the  remaining components are responsible for only a small proportion of this growth (-75,284) i.e. the net impact of returning Canadians (15,392), emigration (-30,946), NPR's (-8,275) and interprovincial migrants (-51,455). More specifically, it is reasonable to point out that it is specifically those components that are of very high  quality (i.e. births and deaths) that enter into explaining a large proportion of the overall growth as observed for Quebec - such that the remaining components would have to have been seriously in error to explain all of the closure error as observed.

Moving on to Ontario, a closure error of 153,651 persons (1.38%) can be compared with an overall growth of 790,527 persons (according to the component method) and 636,876 (as implied by the adjusted 1991 and 1996 censuses). In this context, natural increase is responsible for an additional 352,581 persons, whereas immigration increases in importance , with 619,976 immigrants.  With the remaining components, Demography documents a net loss of 182,030 persons.  In British Columbia, a total growth of 460,604 persons (according to the component method) can be compared with a growth of 508,850 (as implied in the adjusted Census data) for a closure error of -48,246 (-1.24%).  In British Colombia, natural increase contributes 102,357, immigration is responsible for more than twice this amount at 213,589, whereas the remaining components are responsible for a net gain of 144,657 persons.  In comparing total growth to the initial closure error, it is not entirely surprising that British Columbia witness a sizeable closure error - as for example, total interprovincial migration (at 168,252), in and of itself, is about four times the initial closure error for the province as a whole.  As the impact of such factors as "emigration", "returning Canadians" and "interprovincial migration" increases, the likelihood of

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[11] Newfoundland also has a very large closure error in 1996, ranking second across provinces, at 1.58%.  Of relevance in explaining this error are the difficulties in obtaining precision with smaller provinces strongly influenced by migration (net interprovincial migration, at -23,081 was almost three times the size of Newfoundland's closure error at 8,845 in 1996).

a larger closure error increases.[12]

As previously indicated, the aforementioned problem in the 1991 adjustment for coverage error (i.e. an overstatement of net undercount) likely explains a large portion of the closure error as observed in 1996. Irrespective of this fact, discrepancies remain between post-censal estimates and the 1996 Census adjusted for coverage error, for specific provinces. As is argued by Demography Division, all efforts are made to minimize any error in our population estimates, although inevitably an element of uncertainty persists in our data. Consequently, in interpretation of the observed closure errors, by province, the uncertainty as associated with all demographic components need again be mentioned, i.e. an uncertainty which by its very nature will be higher at the provincial level relative to national figures.

According to Health Statistics Division, problems do not likely lie with birth and death data as information collected on vital events are of extremely high quality (with negligible error, late registrants or miss-classification by province). With "immigration", Citizenship and Immigration Canada collects data of very high quality at the national level, although at the provincial level, it has long been recognized that there may be discrepancies between "intended" destination as stated on administrative records and "actual" province of residence after settlement. With "interprovincial migration", which relies on Revenue Canada Taxation (RCT) data - uncertainty is introduced through the imputation of the migration of "non-filers" (for example, dependants or adults with negligible income not accounted for in taxation records). Interestingly, problems in the estimation of "interprovincial migration" are interrelated with problems in the documentation of immigrants, as interprovincial migration potentially occurs among immigrants prior to completing an income tax form (i.e. a form of migration not captured through either CIC or RCT data). With respect to "emigration", the uncertainty of this component has risen since 1993, as Statistics Canada lost access to a very valuable administrative data set (i.e. the universal Family Allowance Program which has not been successfully replaced by the non-universal Child Tax Benefit program). The "Returning Canadian" component is the weakest of all estimates, and is based on assumptions concerning the proportion of emigrants returning to the country and their length of stay abroad - assumptions that are kept constant

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[12] As previously suggested, this was precisely the situation for Newfoundland over the 1991-1996 intercensal period.

across provinces and territories.[13]   In the estimation of "non-permanent residents" it is felt that Demography Division has relatively recently succeeded in improving substantially on both estimated "net flow" and its provincial distribution as based directly on CIC data (although research continues on this component and it has never been denied that some uncertainty persists).   For further details as to the limitations of all the components as compiled by Demography Division, reference is made to the "Notice to Users" that always accompany our Quarterly releases of Demographic Statistics (Statistics Canada, 1998).[14]

In comparing components estimated by Demography Division with alternate estimates available (as for example, interprovincial migration data as available from either the 1996 Census or the RRC itself), most components generated by Demography Division appear to be reasonably accurate, and would clearly not explain the bulk of the closure error as observed for many provinces.   Yet as will be returned to in a latter section of the current report, there is evidence from the RRC that Demography Division might have systematically understated emigration, a hypothesis that is more than reasonable given the weak empirical basis of extrapolation on this component.   Furthermore, there is evidence from the RRC that the proportion of all Canadians, living temporarily "abroad" without a usual place of residence in Canada, has actually gone up significantly through the 1990's.   As this sub-population of Canadians actually falls outside of the Census universe and has never been explicitly incorporated in Demography Division's population estimates program, a significant increase living abroad,  in and of itself, contributes to a positive error of closure.

# 3. Coverage Study Results: National Age/Sex Estimates

Table 10 and Charts 1-6 present results on gross undercount, gross overcount and net undercount, by 5 year age group and sex, for 1991 and 1996 respectively.  With this first series of charts, estimates of coverage error exclude all error that was added to the census base in the

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[13]   Additional information from Customs and Excise (travelers form E-311) is also used in this estimation.

[14]   The methodologies as employed by Demography Division in the estimation of population growth has long been open to public scrutiny, and Statistics Canada welcomes suggestions from the provincial focal points as to how error its estimation can be further minimized.

form of random additions in both 1991 and 1996 or independent estimates of incompletely enumerated Indian reserves in 1996. Also in Table 10 is estimated change in net undercount rates, by age and sex. As indicated, some of the most pronounced declines in net undercount are found with younger age groups in 1996, whereas this is not typically the case with older Canadians. For example, male net undercount is estimated as down in 1996 for ages 0-24 (particularly for ages 5-14), a generalization which is not true with most (yet not all) older cohorts. With females, net undercount is down noticeably for ages 5-24, whereas older age ages experienced both significant increases and significant declines.[15]

Overall, net undercount is found to have dropped for females (by just under one half a percent) whereas males experienced relative stability in net undercount. For both males and females, gross overcoverage has risen (to a slightly greater extent for females), whereas gross undercount dropped only for females - while actually increasing for males. As a generalization, the age/sex distribution of net undercount seems to have flattened somewhat for females (largely due to increased overcoverage across younger ages, particularly pronounced for ages 20-24), whereas the age/sex distribution of net undercount for males is much the same as in 1991 (partially due to the fact that increased overcoverage for ages 20-24 is offset to a degree by increased undercoverage for this cohort). Overall, these preliminary results seem to suggest that differentials by sex in net undercount have widened somewhat relative to 1991, as female net undercount drops by a greater degree than males (with a drop of .45% relative to .04). Furthermore, the results suggest that some of the most pronounced declines occurred among children and youth.

For comparative purposes, Table 11 and Charts 7-8 present estimates of net undercount, by age and sex, including those results historically added to the census base in the form of random additions (i.e. the 1991 Temporary Residents Study and the 1991 and 1996 Vacancy Check Studies). Furthermore, the 1996 estimates of net undercount include the independently derived figures on persons missed in incompletely or partially enumerated Indian Reserves - in order to maintain conceptual consistency in the estimates of coverage error over time. In potentially isolating the impact of error in the coverage studies relative to the components of

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[15] The initial estimate produced in the 1991 RRC was a very high net undercount for females aged 0-4 (at fully 3.75%), which was revised on the basis of information on this cohort's expected sex ratio. Consequently, the above generalization could be revised to suggest that net undercount is down substantially across all ages 0-24.

demographic change, it is logical that we consider simultaneously the full estimate of persons missed, by age and sex. In shifting our emphasis to this more comprehensive figure, it is important to appreciate that the level and age/ sex distribution of net undercount shifts to a noticeable extent, and perhaps more importantly for our purposes, the estimated change in net undercount over time is modified (in terms of both level and age/sex distribution).

In moving on to the net undercount of all studies combined, it is interesting to observe that (i) there is less of a differential decline by sex (as net undercount among males declines by .46% as opposed to .71% among females), and (ii) the change in the age/sex pattern of net undercount shifts to a considerable extent (such that selected age groups who had initially been documented as witnessing an increase in net undercount actually shift to a decline in net undercount, or vise versa). To provide merely one example, while preliminary data excluding random additions and incompletely enumerated reserves (Table 10) for males aged 25-29 suggests an increase in net undercount (by .51%), the results from all coverage studies combined (in Table 11) suggest a slight decline (by about .2%). It is noteworthy that the shift in terms of random additions and incompletely enumerated Indian reserves has a greater impact on males than on females, with its impact particularly pronounced among younger adults.

Merely to provide greater clarity to the comparisons made hence far, Charts 9-10 present the results on net undercount by sex and broad age group (0-19, 20-39 and 40+). Chart 9 presents the RRC based estimates of net undercount by broad age group and sex in 1991 and 1996, whereas Chart 10 presents estimated coverage error while considering the combined impact of all coverage studies. Briefly, both charts demonstrate how the change has been concentrated among children (ages 0-19), irrespective of sex, and younger women (ages 20-39). Coverage error among younger men (ages 20-39) has shifted only slightly, as is true of older cohorts (40+ years), irrespective of gender.

Table 12 presents estimates of 1996 net undercount and closure error by five year age groups and sex. The comparisons are analogous to previous estimates provided for the provinces, but shifting the emphasis to age and sex. Not surprisingly, in light of the sizeable closure error observed for the population as a whole, there is little improvement over 1991 in terms of the age/sex distribution of closure error. For example, there are again noticeable closure errors for persons moving through their latter twenties and into their thirties, as the post-censal estimates are higher than the fully adjusted census for these age groups. Theoretically, many potential sources of error are responsible, including (i) potential errors in the 1996

coverage studies, (ii) the aforementioned errors in the 1991 coverage studies, (iii) problems in either the 1991 or 1996 censuses (for example, in the edit and imputation procedures, or merely response error in the reporting of age), and of course, (iv) uncertainty in the age/sex distribution of components compiled by Demography. In this context, it is difficult to introduce revisions which could improve upon the quality of age/sex data, as it remains far from certain as to where exactly the problem lies.

Table 13 and 14 present closure error, by age group, as was observed in both 1991 and 1996. Table 13 presents the closure error by 5 year age groups and sex, while Table 14 presents these results, again by broad age groups and sex. Interestingly, while the overall closure error increased considerably for the country as a whole in 1996, a systematic increase across all age groups was not observed. By sex, it is noteworthy that the closure error increased by a slightly greater extent among males than among females (up to .94% for males versus .81% for females). With males, it is interesting to note an improvement in terms of closure error for most children and young adults (across all ages 5-29), more than offset by a worsening in closure error across most (yet not all) other cohorts. Among females, improvements were witnessed for children aged 5-19 and young adults aged 25-29 - more than offset by increases in closure error at most other age groups. Unexpected were sizeable increases in closure error for persons aged 50-54 - true for both females and males - with no obvious explanation beyond sampling error. Among many older age groups, closure error worsened somewhat (true for both males, and to a lesser extent for females, aged 40+).[16]

Moving on to reported sex ratios by age, Chart 11 presents these ratio for the previously published 1996 Census figures and the 1996 census population fully adjusted for coverage error (i.e. for random additions, net undercount and incompletely enumerated Indian reserves). In general, it is appreciated that the RRC adjustments leave for sex ratios that are largely in line with expectations, i.e. a very gradual decline in sex ratios from birth through to middle adult

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[16] Difficulties at the top of the pyramid were anticipated from an early point (particularly given small numbers and improved edit and imputation procedures in the 1996 census) - which not surprisingly gives some of the most pronounced errors among the particularly aged (85+ years). These changes have been discussed elsewhere in a preliminary evaluation of 1996 age/sex data using an earlier set of post-censal estimates (Statistics Canada, 1997).

Demography Division, "Comparisons of the 1996 Census with Post-Censal Estimates, by Age and Sex, Canada, Provinces and Territories, Federal Provincial Meetings, September 1997.

years, with a more pronounced drop at older ages. On the other hand, the unadjusted census figures leave for unacceptably low sex ratios among Canadians moving through their 20's and 30's, figures that are entirely implausible given what is known of the differential mortality and migration experience of younger Canadians. Briefly, it is fully appreciated that the adjustment for undercount, which is noticeably higher for young males than young females, significantly improves upon the reported sex ratios of the Canadian population - albeit there is some evidence to suggest that slight problems remain.

Selected problems that persist in reported sex ratios include: (i) a sex ratio among adolescents and youth that is slightly higher than among infants, and (ii) a higher than expected sex ratio for ages 60-64. The sex ratio at birth has remained virtually static over recent decades, at about 105.5 male births to every 100 female births in Canada. Mortality is higher among males than females, a fact which is true from birth through to the most advanced of ages. Migration, theoretically, should not differ by sex for children, such that one would anticipate no impact on the sex ratio of receiving populations. Consequently, the fact that the RRC figures give sex ratios which are well below 105 for the youngest of ages and increases to nearly 106 by age 15-19 makes no sense in terms of what is known through demography as to sex ratios in Canada   Problems in obtaining very high levels of precision for specific age groups (whether our concern is with ages 60-64 or the youngest of ages) are understandable due to the limited sample size of the RRC.[17]

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[17] Demographic analysis can clearly improve upon the sex ratios of younger age groups, in appreciation that the coverage studies inevitably encounter higher levels of sampling variability for specific age groups. While the level of net undercount as estimated by the RRC for infants aged 0-4 can be accepted, the additional uncertainty in documenting differential undercount by sex can be informed through Demographic analysis at younger ages. As demonstrated through Morissette (1998), robust sex ratios by age can be obtained for younger cohorts, by merely surviving cohorts from their birth through to the census year being evaluated. With relatively reliable data available to Demography Division back several decades, it is possible to obtain highly robust estimates of sex ratios across younger ages, which in turn, can complement data as available from the RRC on the relative undercount of children by sex. Theoretically, there is no clear reason to believe that the undercount of children should differ by sex, suggesting that the coverage studies need not concern themselves with gender among younger ages. This is an approach taken by the U.S. Bureau of the Census; for a review of the utility of demographic analysis in this context, see Robinson et al, 1993.

# 4. RRC estimates of "Emigrated" and "Abroad".

The RRC ultimately classifies individuals as either "missed", "enumerated", "deceased", "emigrated", or "abroad". Consequently, in the evaluation of the RRC, it is useful to systematically compare such outcomes with other sources independent of the coverage studies themselves (if possible). Major discrepancies can be evidence of bias in either the RRC or in the data source that the estimates are being compared with. As indicated in evaluating the 1991 RRC, comparisons on "enumerated" and "deceased" are particularly important, as significant differences from the Census count (in the case of enumerated) and Vital Statistics (in the case of deceased) imply possible biases, in the form of either classification error or problems in the sample selection (Royce, 1993). As Social Survey Methods Division is currently responsible for the evaluation of "enumerated" and "deceased", the current report considers solely RRC based estimates of "emigration" and "abroad". Unfortunately, it is acknowledged that "emigration" is among the weakest of components compiled by Demography, a component which has only increased in uncertainty over recent years. With respect to the abroad, there is unfortunately no data source currently available for comparative purposes (and Demography Division has never attempted to account for this form of temporary mobility in its population estimates). Consequently, the results as obtained from the RRC might tell us as much about the precision of Demography Division's estimates of migration out of Canada as vise versa. Overall, the migration as documented by the RRC has important implications in explanation of the 1996 error of closure.[18]

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[18] As is demonstrated in accompanying documentation from Social Survey Methods Division, at the national level, the RRC based estimate of "enumerated" is not different by a statistically significant amount from comparable 1996 Census figures (an inference which is not true in replicating these comparisons with the 1991 RRC). It is interesting to note that in replicating the 1996 comparison with 1991 data, the difference between the RRC estimate of Canada's enumerated population is easily more than 2 standard errors less than the census count. If this in fact were due to misclassification error, this is further evidence to suggest that the 1991 estimate of "missed" might have been too high. With respect to the RRC estimate of "deceased", again in 1996 the RRC appears to have overstated mortality (by about 6.8% relative to data compiled by Health Statistics Division). With respect to the provincial/territorial distribution of these outcomes, both Quebec and British Columbia are associated with among the largest discrepancies in 1996 on enumerated (although neither have differences that are statistically significant). For an unknown reason, the difference as observed on deceased is greatest for Manitoba (a province which had a similar discrepancy in 1991). For further details as to these comparisons, see the accompanying documentation from Social Survey Methods

Prior to making any comparisons, it is necessary to briefly consider how the RRC classifies "emigration" and "abroad". According to the RRC's classification strategy, a person is classified as emigrated if (i) they leave the country with no intention to return, or (ii) have left the country for more than two years with no information on intentions. In a sense, this roughly corresponds to the concept of emigration that Demography Division has long relied upon, working with administrative data meant to document permanent moves to other countries (as for example, in the change of address file associated with the family allowance program). On the other hand, the RRC introduced a dimension of international migration not historically part of Demography Division's post-censal estimates program, i.e. persons "abroad". A person is classified as "abroad" if they had lived outside of the country, without a usual place of residence in Canada, for (i) at least six months with the intention of returning, or (ii) for at least six months and less than two years without information on intentions. If persons are outside of the country for less than six months, they are considered "enumerable" and can be classified as either "enumerated" or "missed" (unless of course, they specifically stated that there is no intention to return). The RRC is certainly more detailed in attempting to classify mobility out of the country, through the use of a survey and exhaustive tracing procedures.

According to Demography Division, "emigration" is meant to document departures from Canada, involving a change in usual place of residence (with access to only limited data on the migration of Canadians to other countries). Supplementing this concept is the "returning Canadian" component, i.e. Canadian citizens and landed immigrants who previously emigrated from the country, and who subsequently returned to Canada to re-establish a permanent residence. As above indicated, emigration as estimated by the RRC has a more specific definition, including persons who departed from Canada, again involving a change in usual place of residence, and have not returned. On a conceptual level, Demography Division's figure on emigration should be higher than the RRC's estimate (as the former include all emigrants over the intercensal period, irrespective of whether or not they eventually returned to Canada - whereas the latter includes only those emigrants having not returned). As demonstrated in Table 15, irrespective of this conceptual difference, the RRC estimates of emigration are consistently higher than estimates by Demography Division, across most provinces.[19] At the national level,

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Division.

[19] At the provincial/territorial level, the reader is cautioned that the sampling variability as associated with these RRC estimates of emigrants/temporarily abroad is quite high.

the RRC estimates 280,192 emigrants, whereas Demography Division estimates 228,025 emigrants over the intercensal period. Overall, in appreciating the exhaustive tracing and searching procedures as employed by the RRC, this is evidence to suggest that Demography Division has understated the net loss of population through migration to other countries. At the same time, due to conceptual differences between Demography Division and the RRC and the potential for both sampling and misclassification error, it is not possible to decisively demonstrate the extent of this underestimation.

The so called "abroad" category is not explicitly incorporated in either the census target population nor in Demography Division's population estimates program (an omission that could potentially impact on the estimated closure error of the population estimates program). According to preliminary results from the RRC, the number of persons living "abroad" (i.e. excluding emigrants) has risen considerably over the 1991-1996 period (almost doubling, from 84,914 to 153,545 persons). Table 16 presents the RRC based estimates of the abroad, as estimated in 1991 and 1996. Leaving aside whether or not these estimates are accurate, the net effect at the national level would be to reduce the error of closure by the magnitude of its corresponding growth (i.e. by 68,631 persons). Persons who are temporarily abroad and without a usual place of residence in Canada are in actual fact outside the Census target population, and theoretically at least, are not enumerated in both the 1991 and 1996 Census Counts. The observation that this category grew noticeably over the intercensal period is consistent with the post-censal estimate as being too high, as Demography Division does not estimate the "abroad" as a component, while the latter census would be reduced accordingly. Again, the assumption that Demography Division has always implicitly adhered to in this context is that the number of Canadians living temporarily abroad has remained roughly constant over time. If in fact this assumption were true, this would have no impact on overall closure error.

Briefly, it is highlighted that Demography Division has found evidence to suggest that the RRC slightly overestimates "emigrated" and/or "temporarily". This statement is not based on the discrepancy as observed between the RRC estimate and Demography Division's figures, but on the observation that there is a flaw in the design of the RRC in estimating migration to other countries. More specifically, it is not possible for the RRC to identify all non-permanent residents that were selected in the "census" frame of the 1996 sample. Without information on whether selected persons were in actual fact non-permanent residents in the selection from the previous census, it is not possible to isolate the out-migration of non-permanent residents in contrast to Canadian citizens and landed immigrants. This subsequently leads to some

misclassification of abroad and/or emigrated, as NPR's leaving the country should only be classified as "out of scope". As a result of further record linkage efforts, it has been estimated that the final classification may have erroneously classified a maximum of 70,000 NPR'S as either emigrated or abroad.[20] While apparently having no impact on the RRC estimate of missed, this observation does have implications in the explanation of the 1996 closure error.

# 5. Discussion

The 1996 coverage studies indicate that "coverage error" has declined significantly relative to 1991. Overall, census collection appears to have been more successful in 1996, across most provinces and territories. This decline in estimated coverage error might be considered somewhat surprising in light of a few fundamentals on the evolving composition of Canada's population (i.e. more specifically, an increasing proportion of Canada's population are recent immigrants: a sub-population that typically experiences a significantly higher level of coverage error than is true of long time residents). Fully 1,165,190 immigrants landed over the 1991-1996 intercensal period, up from 883,607 over the 1986-1991 period and only 497,030 over the 1981-1986 period.

On the other hand, there was a noticeable drop in the total number of non-permanent residents in Canada - another very difficult to enumerate sub-population (estimated by Demography Division at about 177,000 in 1986, up to about 360,331 by 1991 (June 1st), and

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[20]   In 1991, the RRC estimated 369,813 NPR's in Canada, of which, about 35,922 were immediately classified as "out of scope" (i.e. through tracing they were found to be no longer in Canada). Consequently, the "census" frame and the "missed" frame as selected with the 1996 RRC should have a representative sample of NPR's corresponding roughly to this number identified in 1991. In the "missed" frame, it was possible to identify NPR's that had been classified as leaving the country (i.e. 32,120 were re-classified as "out of scope"). Unfortunately, with the census frame, it was not possible to specifically identify NPR's. In working with CIC data and in tracing permits back in time, it was possible to estimate from the 1996 immigrant frame that an estimated 206,718 immigrants (i.e. obtaining landed immigrant status over the intercensal period) had had NPR permits on Census day, five years ago. In working with the 1996 NPR frame, it was possible to estimate (again in tracing permits back in time) that 24,732 NPR'S also had permits five years earlier. This leaves for an estimated 70,321 NPR's who were living in Canada 5 years ago, but have yet to be accounted for (369,813 - 35,922 - 206,718 - 24,732 -32,120). It is uncertain as to how many of the remaining 70,321 left the country, and were erroneously classified as either emigrated or abroad.

down to about 232,453 by 1996 - May 1st).   This change, independent of any other factor, would contribute to reduced coverage error, as for example, NPR'S in both 1991 and 1996 had gross undercoverage rates of the order of 20%.  Another factor that might have had a small effect in terms of reducing net undercount is the simple reality that Canada's population is gradually aging - an observation which has also been raised in explanation as to why the mobility of the Canadian population has stabilized relatively recently.  Relative to past Censuses, the proportion of Canada's population that are in those "difficult to enumerate" ages has declined (ages 20-34 years), such that independent of any other factor, one might expect a slight decline in coverage error overall.  While the change as observed in the age structure of Canada's population over the last five years is likely to had only a very small impact on the quality of the Canadian Census, this factor independent of any other would expectantly contribute to reduced net undercount.[21] On the other hand, this trend would certainly not explain why age-specific rates have declined noticeably, among children and young women.

Two factors previously mentioned which might have contributed to a decline in net undercount include: (i) the fact that Census day was shifted to May 14th from the 2nd of June, with the specific intention of improving coverage, and (ii) the reallocation of resources in census collection in 1996, which specifically targeted selected enumeration areas in core city areas of Montreal, Toronto and Vancouver (historically known to have very high non-response rates).  In addition, it has been acknowledged that reduced  net undercount might also have been partially an artifact of enhancements in the methods as applied in its measurement.  More specifically, net undercount has declined due to (i)  methodological enhancements in the documentation of "missed" in the Reverse Record Check (RRC) - which has demonstrated that the 1991 estimate of "missed" was too high, and (ii) the development of new automated matching techniques that improve on the documentation of "overcount" - which indicate that the 1991 estimate of "double counting" was too low.  Both of these changes need be explicitly considered in explanation of observed closure error in 1996.

The development of automated methods (not available in 1991) have already demonstrated a misclassification of about 50,000 in 1991, erroneously classified as missed rather

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[21]  Direct standardization on age with net undercount rates demonstrate this fact, i.e. using the same set of undercount rates but applied separately on the 1991 and 1996 Canadian age structures.  Overall, a slight decline in coverage error is observed, independent of anything else, albeit not nearly of the same magnitude as documented by the RRC.

than enumerated.[22] As the provincial/territorial distribution of this error is available, it is possible to consider its corresponding impact on closure error by province/territory. With respect to overcoverage, it is appreciated that searching and linkage procedures in 1996 began with a much larger sample and many more addresses per selected person - whereas automated matching procedures were for the first time capable of systematically searching both within and across enumeration areas.[23] Again, it is interesting to consider what sort of impact this might have had on closure error as reported by province/territory, if for example, the level of overcoverage observed in 1996 had also been observed in 1991. Table 17 provides estimated closure error in 1996 by province/territory, on the condition that (i) the number missed in 1991 is corrected, and (ii) estimated overcoverage levels for 1991 are set at 1996 levels. Whereas the revision on "missed" is based on direct empirical evidence, the revision on overcoverage is admittedly a hypothesis as to what overcoverage might have looked like in 1991.

In summarizing the results of this exercise, the national closure error is reduced from an initial .87% down to .47%. By province, it is interesting to note substantial improvements in eastern and central Canada, whereas in selected western provinces (e.g. British Columbia), closure error actually increases. This is not surprising in recognition that British Columbia had initially a negative closure error, i.e. the 1996 Census after adjustment was actually larger than Demography Division's post-censal estimate. An acceptance of this correction for missed in 1991 as well as what appears to be a reasonable hypothesis on overcoverage, shifts the emphasis in British Columbia to other potential factors in explanation of closure error.

As previously indicated, while the RRC estimates of emigrated and abroad are too high (due to misclassification error inherent in the RRC), while emigration estimates as generated by Demography Division appear to be too low. Furthermore, the absence of information on the abroad might have also contributed to closure error, as there is no effort to track temporary mobility in and out of the country. Demography Division recognizes these difficulties (largely due to an absence of data on persons leaving the country) and considers this to be a priority in terms of future research. At the provincial level, it is likely that much of the closure error that

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[22] The so-called "Monster Match", as developed in research leading up to the 1996 RRC, has already demonstrated decisively that 53,339 persons too many were classified as missed, when in actual fact they were enumerated.

[23] For further details on these methodological enhancements, see accompanying documentation provided by Social Survey Methods Division.

remains in central Canada is related to uncertainty in these components. As to the negative closure error observed in British Columbia, it is appreciated that this province in particular has been strongly influenced by migration (both interprovincial and international) over recent years, such that it is not surprising that there are difficulties in obtaining precision in estimation.[24] Furthermore, is appreciated that with the closure errors that remain by province/territory, sampling error influences the post-censal estimate (i.e. in the adjustment of the underlying baseline population) and the 1996 coverage studies.

# 6. Summary

The current document presented an evaluation of the results of the 1996 Census coverage studies. Overall, it has been documented through the Coverage Studies that Census "coverage error" has declined significantly in 1996 - a conclusion that was not anticipated by Demography Division. By province/territory, the relative success of census collection varied considerably, from a significant upturn in overall coverage error in British Columbia through to substantial reductions in eastern and central Canada. By age and sex, coverage error declined for children and young women, while remaining relatively stable for young men and older Canadians irrespective of gender. Overall gross overcount is up substantially whereas gross undercount is down - particularly if we consider change as documented through all of the coverage studies, including the number of random additions in 1991 and 1996.

As a result of an inflated estimate of net undercount in the 1991 Coverage Studies, Demography Division's post-censal estimate in 1996 was significantly higher than the 1996 Census figure (after adjustment for the 1996 Coverage Studies). The difference between the 1996 Census adjusted for coverage error and the most up to date post-censal estimate by Demography Division is up from the previous intercensal period, due to two major factors, including (i) methodological enhancements in the documentation of "missed" in the Reverse Record Check (RRC) - which has demonstrated that the 1991 estimate of "missed" was too high, and (ii) the development of new automated matching techniques that improve on the

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[24] Over the 1991-1996 intercensal period, British Columbia received fully 213,589 immigrants and 168,272 interprovincial migrants from other parts of the country, which together comprises more than 10% of British Columbia's 1996 population. This growth due to migration is unmatched across Canadian provinces.

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Table 1.   Estimated Net Undercount by Province/Territory, 1991 and 1996 [1]

| | {1} 1991 net undercount [i] | {2} rate | {3} 1996 net undercount | {4} rate | difference in estimated rates {5=4-2} |
|---|---|---|---|---|---|
| Nfld | 11,380 | 1.96 | 9,529 | 1.70 | -0.26 |
| PEI | 1,221 | 0.93 | 1,041 | 0.77 | -0.16 |
| NS | 17,192 | 1.87 | 20,540 | 2.21 | 0.34 |
| NB | 24,157 | 3.23 | 14,446 | 1.92 | -1.31 |
| Que | 179,793 | 2.54 | 119,118 | 1.64 | -0.90 |
| Ont | 373,990 | 3.58 | 321,490 | 2.90 | -0.68 |
| Man | 20,338 | 1.83 | 19,577 | 1.73 | -0.10 |
| Sask | 17,720 | 1.76 | 28,447 | 2.79 | 1.03 |
| Alb | 51,262 | 1.97 | 68,791 | 2.49 | 0.52 |
| BC | 90,019 | 2.67 | 153,141 | 3.95 | 1.28 |
| Yukon | 1,148 | 3.97 | 1,165 | 3.65 | -0.32 |
| NWT | 3,192 | 5.23 | 3,071 | 4.55 | -0.68 |
| Canada | 791,412 | 2.82 | 760,356 | 2.57 | -0.25 |

[i] Results from all coverage studies, excluding those added as Random Additions
    Slight revisions have been introduced by Demography Division,  from an initial net undercount rate of 2.87% in 1991.

tables for report data as of end feb 1998

Table 2.  Estimated Net Undercount (including Random Additions)  by Province/Territory, 1991 and 1996.

| | {1} 1991 net undercount [i] | {2} rate | {3} 1996 net undercount [ii] | {4} rate | {5=4-2} difference in estimated rates |
|---|---|---|---|---|---|
| Nfld | 14,778 | 2.55 | 10,634 | 1.89 | -0.65 |
| PEI | 1,962 | 1.50 | 1,450 | 1.07 | -0.43 |
| NS | 22,652 | 2.47 | 22,368 | 2.41 | -0.06 |
| NB | 28,779 | 3.85 | 15,855 | 2.11 | -1.74 |
| Que | 236,263 | 3.34 | 148,358 | 2.04 | -1.30 |
| Ont | 452,937 | 4.33 | 380,115 | 3.43 | -0.90 |
| Man | 26,768 | 2.41 | 22,329 | 1.97 | -0.44 |
| Sask | 28,693 | 2.85 | 30,513 | 2.99 | 0.14 |
| Alb | 73,983 | 2.85 | 85,862 | 3.10 | 0.25 |
| BC | 118,748 | 3.52 | 169,670 | 4.37 | 0.85 |
| Yukon | 1,501 | 5.19 | 1,368 | 4.28 | -0.90 |
| NWT | 3,750 | 6.16 | 3,104 | 4.60 | -1.56 |
| Canada | 1,010,814 | 3.60 | 891,626 | 3.01 | -0.59 |

[i] Estimated net undercount includes random additions, as determined by the 1991 Vacancy Check Study
and the 1991 Temporary Residents Study.  Slight revisions have been introduced by Demography Division,
in light of unacceptable sex ratios ages 0-4 in 1991

[ii] Estimated net undercount includes random additions, as determined by the 1996 Vacancy Check Study.
In addition, estimated net undercount also includes independent estimates of the incompletely  or partially
enumerated Indian Reserves in 1996.

Eng-tabs

Table 3. Estimated Gross Undercount Rates, Gross Overcount Rates, Net Undercount Rates, Random Additions, and Percentage Change in Rates (1991-1996) by Province/Territory

| | (1) gross undercount | (2) 1991 - gross overcount | (3=1-3) net undercount | (4) random additions Vacancy Check Study | (5) Temporary Resident Study | (6) total - rand add | (7=3+6) total [I] |
|---|---|---|---|---|---|---|---|
| Nfld | 2.44 | 0.48 | 1.96 | 0.13 | 0.45 | 0.59 | 2.55 |
| PEI | 1.67 | 0.74 | 0.93 | 0.32 | 0.25 | 0.57 | 1.50 |
| NS | 2.23 | 0.38 | 1.87 | 0.19 | 0.40 | 0.60 | 2.47 |
| NB | 3.69 | 0.46 | 3.23 | 0.29 | 0.33 | 0.82 | 3.85 |
| Que | 3.11 | 0.57 | 2.54 | 0.57 | 0.23 | 0.80 | 3.34 |
| Ont | 4.17 | 0.59 | 3.58 | 0.48 | 0.30 | 0.75 | 4.33 |
| Man | 2.28 | 0.45 | 1.83 | 0.21 | 0.37 | 0.58 | 2.41 |
| Sask | 2.11 | 0.35 | 1.76 | 0.61 | 0.48 | 1.09 | 2.85 |
| Ab | 2.49 | 0.51 | 1.97 | 0.45 | 0.43 | 0.87 | 2.85 |
| BC | 3.35 | 0.68 | 2.67 | 0.40 | 0.45 | 0.65 | 3.52 |
| Yukon | 4.26 | 0.29 | 3.97 | 0.03 | 1.19 | 1.22 | 5.19 |
| NWT | 5.52 | 0.29 | 5.23 | 0.19 | 0.73 | 0.92 | 6.16 |
| Canada | 3.38 | 0.56 | 2.82 | 0.45 | 0.33 | 0.78 | 3.60 |

| | (8) gross undercount | (9) 1996 - gross overcount | (10=8-9) net undercount | (11) total - rand add Vacancy Check Study | (12) Incompletely Enumerated Indian Reserves | (13=10+11+1) total [II] |
|---|---|---|---|---|---|---|
| Nfld | 2.51 | 0.61 | 1.70 | 0.20 | | 1.89 |
| PEI | 1.78 | 1.01 | 0.77 | 0.17 | 0.13 | 1.07 |
| NS | 2.75 | 0.54 | 2.21 | 0.20 | | 2.41 |
| NB | 2.51 | 0.59 | 1.92 | 0.12 | 0.06 | 2.11 |
| Que | 2.54 | 0.90 | 1.64 | 0.24 | 0.16 | 2.04 |
| Ont | 3.59 | 0.69 | 2.90 | 0.36 | 0.17 | 3.43 |
| Man | 2.62 | 0.89 | 1.73 | 0.22 | 0.02 | 1.97 |
| Sask | 3.36 | 0.57 | 2.79 | 0.16 | 0.04 | 2.99 |
| Ab | 3.11 | 0.62 | 2.49 | 0.31 | 0.31 | 3.10 |
| BC | 4.83 | 0.88 | 3.95 | 0.31 | 0.07 | 4.37 |
| Yukon | 4.29 | 0.64 | 3.85 | 0.36 | | 4.28 |
| NWT | 5.77 | 1.22 | 4.55 | 0.64 | 0.05 | 4.60 |
| Canada | 3.33 | 0.78 | 2.57 | 0.30 | 0.15 | 3.01 |

| | (14=8-1) gross undercount | (15=9-2) Difference in Rates gross overcount | (16=10-3) net undercount | (17=11-6) random additions | (18) Incompletely Enumerated Indian Reserves | (19=13-7) total |
|---|---|---|---|---|---|---|
| Nfld | 0.07 | 0.33 | -0.26 | -0.39 | 0.00 | -0.65 |
| PEI | 0.11 | 0.27 | -0.16 | -0.39 | 0.13 | -0.43 |
| NS | 0.52 | 0.18 | 0.34 | -0.40 | 0.00 | -0.06 |
| NB | -1.18 | 0.13 | -1.31 | -0.50 | 0.06 | -1.74 |
| Que | -0.57 | 0.33 | -0.90 | -0.56 | 0.16 | -1.30 |
| Ont | -0.58 | 0.10 | -0.68 | -0.40 | 0.17 | -0.90 |
| Man | 0.34 | 0.44 | -0.10 | -0.36 | 0.02 | -0.44 |
| Sask | 1.25 | 0.22 | 1.03 | -0.93 | 0.04 | 0.14 |
| Alb | 0.62 | 0.11 | 0.52 | -0.57 | 0.31 | 0.25 |
| BC | 1.48 | 0.20 | 1.28 | -0.49 | 0.07 | 0.85 |
| Yukon | 0.03 | 0.35 | -0.32 | -0.58 | 0.00 | -0.90 |
| NWT | 0.25 | 0.93 | -0.68 | -0.87 | 0.00 | -1.56 |
| Canada | -0.05 | 0.20 | -0.25 | -0.49 | 0.15 | -0.59 |

[I] all rates are calculated with the fully adjusted Census population in the denominator. Estimated
net undercount includes random additions, as determined by the 1991 Vacancy Check Study
and the 1991 Temporary Residents Study. Slight revisions have been introduced by Demography Division, from an initial net undercount rate of 2.87% in 1991.

[II] Estimated net undercount includes random additions, as determined by the 1996 Vacancy Check Study, gross overcoverage and gross undercoverage.
In addition, estimated net undercount also includes independent estimates of the incompletely or partially enumerated Indian Reserves in 1996.
This explains why, for selected provinces, columns 6-9 do not sum to column 10

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Table 4.  Random Additions, 1991-1996, by Province/Territory

| | {1} 1991 Vacancy Check Study | {2} 1991 Temporary Residents Study | {3=1+2} 1991 Total Random Additions | {4} 1996 Vacancy Check Study, Total Random Additions |
|---|---|---|---|---|
| Nfld | 777 | 2,621 | 3,398 | 1,105 |
| PEI | 418 | 323 | 741 | 234 |
| NS | 1,777 | 3,683 | 5,460 | 1,828 |
| NB | 2,163 | 2,459 | 4,622 | 924 |
| Que | 40,008 | 16,462 | 56,470 | 17,288 |
| Ont | 48,027 | 30,920 | 78,947 | 39,532 |
| Man | 2,332 | 4,098 | 6,430 | 2,475 |
| Sask | 6,165 | 4,808 | 10,973 | 1,615 |
| Alb | 11,629 | 11,092 | 22,721 | 8,582 |
| BC | 13,399 | 15,330 | 28,729 | 13,885 |
| Yukon | 8 | 345 | 353 | 203 |
| NWT | 115 | 443 | 558 | 33 |
| Total | 126,818 | 92,584 | 219,402 | 87,704 |

| | 1991 Vacancy Check [i] | 1991 Temporary Residents | Total 1991 - random additions | Total 1996 - random additions |
|---|---|---|---|---|
| Nfld | 0.13 | 0.45 | 0.59 | 0.20 |
| PEI | 0.32 | 0.25 | 0.57 | 0.17 |
| NS | 0.19 | 0.40 | 0.60 | 0.20 |
| NB | 0.29 | 0.33 | 0.62 | 0.12 |
| Que | 0.57 | 0.23 | 0.80 | 0.24 |
| Ont | 0.46 | 0.30 | 0.75 | 0.36 |
| Man | 0.21 | 0.37 | 0.58 | 0.22 |
| Sask | 0.61 | 0.48 | 1.09 | 0.16 |
| Alb | 0.45 | 0.43 | 0.87 | 0.31 |
| BC | 0.40 | 0.45 | 0.85 | 0.36 |
| Yukon | 0.03 | 1.19 | 1.22 | 0.64 |
| NWT | 0.19 | 0.73 | 0.92 | 0.05 |
| Total | 0.45 | 0.33 | 0.78 | 0.30 |

[i] random additions, expressed as a percentage of 1991 and 1996 Censuses, after all adjustments for coverage error

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Table 5. Coverage Study Results, Relative to Population Estimate (1996 - Census Day)

| | (1) 1996 census count with random additions(i) | (2) 1996 gross undercount(i) | (3) 1996 gross overcount | (4=2-3) 1996 net undercount | (5) net under rate (ii) | (6) Indian Reserves | (7=1+4+6) 1996 Census RRC Adjusted (iii) | (8) 1996 estimate post-censal (iv) | (9=8-7) Error of closure (v) | (10=9/7*100) error of closure (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| Nfld | 551,792 | 14,093 | 4,564 | 9,529 | 1.70 | | 561,321 | 570,166 | 8,845 | 1.58 |
| PEI | 134,557 | 2,412 | 1,371 | 1,041 | 0.77 | 175 | 135,773 | 136,354 | 581 | 0.43 |
| NS | 909,282 | 25,584 | 5,044 | 20,540 | 2.21 | | 929,822 | 940,454 | 10,632 | 1.14 |
| NB | 738,133 | 18,906 | 4,460 | 14,446 | 1.92 | 485 | 753,064 | 760,698 | 7,634 | 1.01 |
| Que | 7,138,795 | 183,990 | 64,872 | 119,118 | 1.64 | 11,952 | 7,269,865 | 7,390,886 | 121,021 | 1.66 |
| Ont | 10,753,573 | 397,565 | 76,075 | 321,490 | 2.90 | 19,093 | 11,094,156 | 11,247,807 | 153,651 | 1.38 |
| Man | 1,113,898 | 29,677 | 10,100 | 19,577 | 1.73 | 277 | 1,133,752 | 1,136,064 | 2,312 | 0.20 |
| Sask | 990,237 | 34,212 | 5,765 | 28,447 | 2.79 | 451 | 1,019,135 | 1,016,846 | -2,289 | -0.22 |
| Alb | 2,696,826 | 85,996 | 17,205 | 68,791 | 2.49 | 8,489 | 2,774,106 | 2,779,896 | 5,790 | 0.21 |
| BC | 3,724,500 | 187,221 | 34,080 | 153,141 | 3.95 | 2,644 | 3,880,285 | 3,832,039 | -48,246 | -1.24 |
| Yukon | 30,766 | 1,369 | 204 | 1,165 | 3.65 | | 31,931 | 31,268 | -663 | -2.08 |
| NWT | 64,402 | 3,894 | 823 | 3,071 | 4.55 | | 67,473 | 66,621 | -852 | -1.26 |
| total | 28,846,761 | 984,920 | 224,560 | 760,360 | 2.57 | 43,566 | 29,650,683 | 29,909,099 | 258,416 | 0.87 |

(i) excludes random additions (i.e 1996 Vacancy Check)

(ii) estimated net undercount / (1996 Census published figure + estimated net undercount)

(iii) 1996 census count, with random additions+1996 gross undercount-gross overcount+ Indian reserves

(iv) Post-Censal Estimates for May 14th, obtained with monthly population estimates, available January 1998

(v) post censal estimate minus RRC adjusted Census Count

Table 6. Error of Closure of Estimated Total Population, 1971-1996

| | Error of Closure | Percentage |
|---|---|---|
| 1971-1976 | 134,465 | 0.58 |
| 1976-1981 | 87,395 | 0.35 |
| 1981-1986 | 81,374 | 0.32 |
| 1986-1991 | 57,743 | 0.21 |
| 1991-1996 | 258,416 | 0.87 |

Source: Revised Intercensal Population and Family Estimates, July 1, 1971-1991
Demography Division, Catalogue 91-537 Occasional, 1994

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Table 7. Estimated Error of Closure, by Province/Territory, 1991 and 1996.

| | 1991 error of closure | 1996 error of closure |
|---|---|---|
| Nfld | 1.32 | 1.58 |
| PEI | 2.15 | 0.43 |
| NS | 0.52 | 1.14 |
| NB | -0.17 | 1.01 |
| Que | 0.10 | 1.66 |
| Ont | -0.06 | 1.38 |
| Man | 0.90 | 0.20 |
| Sask | 1.30 | -0.22 |
| Alb | 0.59 | 0.21 |
| BC | 0.22 | -1.24 |
| Yukon | -3.13 | -2.08 |
| NWT | -3.16 | -1.26 |
| Canada | 0.21 | 0.87 |

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Table 8. Components of Demographic Growth as Documented by Demography Division (1971-1996) and Estimated Growth as Implied by Census (1971-1996) after Adjustment by the Coverage Studies, Estimates of Closure Error (1971-1996)

| | [1] births | [2] deaths | [3=1+2] natural increase | [4] Immigrants | [5] Emigrants | [6] Returning Canadians | [7] Net flow in non-perm res | [8=4+5+6+7] net migration | [9=3+8] Total growth components Demogr Division | [10] Total growth between Censuses after RRC adjustment | [11=9-10] Error of Closure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1971-1976 [1] | 1,754,750 | -823,614 | 931,136 | 852,329 | -358,120 | 186,239 | 13,981 | 694,429 | 1,625,565 | 1,491,100 | 134,465 |
| 1976-1981 | 1,819,866 | -842,577 | 977,289 | 587,027 | -278,228 | 152,537 | 31,270 | 492,606 | 1,469,895 | 1,382,500 | 87,395 |
| 1981-1986 | 1,872,245 | -885,471 | 986,774 | 497,030 | -277,579 | 132,670 | 47,279 | 399,400 | 1,386,174 | 1,304,800 | 81,374 |
| 1986-1991 | 1,933,293 | -945,969 | 987,324 | 883,607 | -212,532 | 108,612 | 203,532 | 883,219 | 1,970,543 | 1,912,800 | 57,743 |
| 1991-1996 | 1,918,819 | -1,015,720 | 903,100 | 1,165,190 | -228,025 | 111,903 | -128,390 | 920,678 | 1,823,778 | 1,565,361 | 258,417 |

[1] 1971-1991 data corresponds to July 1st - June 30th estimates, whereas the 1991-1996 data corresponds to the intercensal period June 4, 1991 to May 14,1996

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Table 9.  Provincial/Territorial Components of Demographic Growth as Documented by Demography Division (1991-1996)[] and  Estimated Growth and Closure Errors
as Implied by Census after Adjustment by the Coverage Studies (1991-1996)

| | (1) Births | (2) Deaths | (3=1+2) Natural Increase | (4) Immigrants | (5) Emigrants | (6) Returning Canadians | (7) Net flow in non-perm. Res | (8=4+5+6+7) International Migration | (9) Net Interprovincial Migration | (10=3+8+9) Total Growth implied by post-censal estimate, May 14, 1996 | (11) Total growth implied between Censuses after RRC adj. | (12=10-11) Error of Closure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nfld. - T.-N. | 31,808 | -19,365 | 12,442 | 3,412 | -1,364 | 690 | -1,802 | 935 | -23,081 | -9,703 | -18,548 | 8,845 |
| P.E.I. - I.-P.-É. | 8,773 | -5,697 | 3,076 | 772 | -389 | 181 | 109 | 673 | 1,624 | 5,373 | 4,792 | 581 |
| N.S. - N.-É. | 55,969 | -37,780 | 18,189 | 14,629 | -4,122 | 1,822 | -1,906 | 10,423 | -5,248 | 23,364 | 12,732 | 10,632 |
| N.B. - N.-B. | 44,591 | -28,667 | 15,923 | 3,386 | -4,680 | 2,247 | -972 | -18 | -3,242 | 12,663 | 5,029 | 7,634 |
| Quebec - Québec | 454,840 | -253,966 | 200,674 | 190,289 | -30,946 | 15,392 | -8,275 | 166,480 | -51,455 | 315,679 | 194,658 | 121,021 |
| Ontario | 731,050 | -378,469 | 352,581 | 619,976 | -96,734 | 47,999 | -92,308 | 478,933 | -40,987 | 790,527 | 636,876 | 153,651 |
| Manitoba | 61,782 | -46,024 | 35,758 | 22,173 | -11,050 | 5,352 | -2,950 | 13,525 | -25,465 | 23,818 | 21,506 | 2,312 |
| Saskatchewan | 70,417 | -40,543 | 29,874 | 11,336 | -4,857 | 2,359 | -1,770 | 7,068 | -28,779 | 10,163 | 12,452 | -2,289 |
| Alberta | 199,960 | -76,125 | 123,835 | 84,474 | -38,455 | 16,673 | -12,483 | 52,209 | 7,315 | 183,360 | 177,570 | 5,790 |
| B.C. - C.-B. | 229,591 | -127,234 | 102,357 | 213,589 | -34,720 | 16,843 | -5,738 | 189,974 | 168,272 | 460,604 | 508,850 | -48,246 |
| Yukon | 2,459 | -621 | 1,839 | 519 | -329 | 160 | -79 | 271 | 218 | 2,328 | 2,991 | -663 |
| N.W.T. - T.-N.-O. | 7,779 | -1,229 | 6,550 | 634 | -376 | 185 | -217 | 223 | -1,172 | 5,601 | 6,453 | -852 |
| CANADA | 1,918,819 | -1,015,720 | 903,100 | 1,165,190 | -228,025 | 111,903 | -128,390 | 920,678 | 0 | 1,823,778 | 1,565,361 | 258,417 |

June 4, 1991 to May 14, 1996

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Table 10. Estimated Gross Undercoverage, Gross Overcoverage and Net Undercoverage, by Sex and 5-year Age Groups, 1991-1996

| MALE | (1) 1991 gross undercoverage | (2) 1991 gross overcoverage | (3=1-2) 1991 net undercoverage | (4) 1996 gross undercoverage | (5) 1996 gross overcoverage | (6=4-5) 1996 net undercoverage | (7=3-6) Change In Net Undercount |
|---|---|---|---|---|---|---|---|
| 0-4 | 2.79 | 0.53 | 2.26 | 2.60 | 0.60 | 2.00 | -0.26 |
| 5-9 | 2.43 | 0.43 | 1.99 | 1.81 | 1.17 | 0.64 | -1.35 |
| 10-14 | 2.22 | 0.50 | 1.72 | 1.25 | 0.81 | 0.44 | -1.28 |
| 15-19 | 3.55 | 0.85 | 2.70 | 3.74 | 1.22 | 2.52 | -0.18 |
| 20-24 | 8.98 | 1.24 | 7.74 | 9.83 | 2.46 | 7.37 | -0.37 |
| 25-29 | 8.68 | 0.70 | 7.97 | 9.44 | 0.96 | 8.48 | 0.51 |
| 30-34 | 5.91 | 0.33 | 5.57 | 8.64 | 0.45 | 8.39 | 0.82 |
| 35-39 | 3.72 | 0.55 | 3.17 | 4.93 | 0.26 | 4.67 | 1.50 |
| 40-44 | 3.58 | 0.38 | 3.21 | 3.31 | 0.50 | 2.81 | -0.40 |
| 45-49 | 2.34 | 0.54 | 1.80 | 2.75 | 0.21 | 2.54 | 0.74 |
| 50-54 | 1.69 | 0.51 | 1.18 | 1.55 | 0.53 | 1.02 | -0.18 |
| 55-59 | 2.11 | 0.42 | 1.89 | 2.68 | 0.76 | 1.92 | 0.23 |
| 60-64 | 1.57 | 0.54 | 1.03 | 2.84 | 0.19 | 2.45 | 1.42 |
| 65-69 | 1.57 | 0.55 | 1.03 | 1.97 | 0.37 | 1.60 | 0.57 |
| 70-74 | 1.57 | 0.54 | 1.03 | 1.15 | 0.30 | 0.85 | -0.18 |
| 75-79 | 1.57 | 0.55 | 1.03 | 1.68 | 0.41 | 1.47 | 0.44 |
| 80-84 | 1.57 | 0.55 | 1.03 | 1.78 | 0.21 | 1.57 | 0.54 |
| 85+ | 1.57 | 0.55 | 1.03 | 2.11 | 0.28 | 1.83 | 0.80 |
| males | 3.95 | 0.58 | 3.37 | 4.06 | 0.73 | 3.33 | -0.04 |

| FEMALE | (1) 1991 gross undercoverage | (2) 1991 gross overcoverage | (3=1-2) 1991 net undercoverage | (4) 1996 gross undercoverage | (5) 1996 gross overcoverage | (6=4-5) 1996 net undercoverage | (7=3-6) Change In Net Undercount |
|---|---|---|---|---|---|---|---|
| 0-4 | 2.75 | 0.60 | 2.15 | 3.42 | 0.69 | 2.73 | 0.58 |
| 5-9 | 3.01 | 0.42 | 2.59 | 1.69 | 0.72 | 0.97 | -1.82 |
| 10-14 | 2.29 | 0.49 | 1.80 | 1.29 | 1.11 | 0.18 | -1.82 |
| 15-19 | 3.96 | 0.73 | 3.23 | 3.33 | 1.52 | 1.81 | -1.42 |
| 20-24 | 7.36 | 1.10 | 6.26 | 8.67 | 2.53 | 4.14 | -2.12 |
| 25-29 | 4.96 | 0.45 | 4.51 | 5.50 | 0.97 | 4.53 | 0.02 |
| 30-34 | 3.02 | 0.55 | 2.47 | 2.88 | 0.43 | 2.45 | -0.02 |
| 35-39 | 1.99 | 0.47 | 1.52 | 2.05 | 0.40 | 1.65 | 0.13 |
| 40-44 | 2.03 | 0.47 | 1.56 | 1.36 | 0.32 | 1.04 | -0.52 |
| 45-49 | 1.52 | 0.48 | 1.04 | 1.60 | 0.56 | 1.04 | 0.00 |
| 50-54 | 0.73 | 0.36 | 0.37 | 1.96 | 0.68 | 1.28 | 0.91 |
| 55-59 | 1.05 | 0.18 | 0.87 | 2.87 | 0.62 | 2.25 | 1.38 |
| 60-64 | 1.60 | 0.55 | 1.05 | 1.25 | 0.68 | 0.57 | -0.48 |
| 65-69 | 1.60 | 0.55 | 1.05 | 1.85 | 0.26 | 1.59 | 0.54 |
| 70-74 | 1.60 | 0.55 | 1.05 | 1.40 | 0.21 | 1.19 | 0.14 |
| 75-79 | 1.60 | 0.55 | 1.05 | 0.31 | 0.18 | 0.13 | -0.92 |
| 80-84 | 1.60 | 0.55 | 1.05 | 2.99 | 0.62 | 2.37 | 1.32 |
| 85+ | 1.60 | 0.55 | 1.05 | 0.93 | 1.12 | -0.19 | -1.24 |
| females | 2.82 | 0.54 | 2.28 | 2.81 | 0.78 | 1.83 | -0.45 |
| both sexes | 3.38 | 0.56 | 2.82 | 3.33 | 0.76 | 2.57 | -0.25 |

Table 11. Estimated Net Undercoverage, by Sex and Broad Age Groups, 1991-1996
Results of all Coverage Studies Combined, including Temporary Residents Study and Vacancy Check [1]

| MALE | (1) - 1991 - | (2) -1996 - | (3=2-1) Change in Net Undercount |
|---|---|---|---|
| 0-4 | 2.71 | 2.51 | -0.21 |
| 5-9 | 2.40 | 1.12 | -1.29 |
| 10-14 | 2.12 | 0.87 | -1.26 |
| 15-19 | 4.03 | 2.93 | -1.10 |
| 20-24 | 9.02 | 7.81 | -1.22 |
| 25-29 | 9.18 | 8.98 | -0.20 |
| 30-34 | 6.63 | 6.83 | 0.20 |
| 35-39 | 3.97 | 5.07 | 1.10 |
| 40-44 | 3.95 | 3.20 | -0.75 |
| 45-49 | 2.52 | 2.86 | 0.34 |
| 50-54 | 1.94 | 1.42 | -0.52 |
| 55-59 | 2.48 | 2.38 | -0.10 |
| 60-64 | 1.85 | 2.91 | 1.06 |
| 65-69 | 2.00 | 2.09 | 0.09 |
| 70-74 | 2.01 | 1.34 | -0.67 |
| 75-79 | 1.97 | 1.98 | 0.01 |
| 80-84 | 1.97 | 2.07 | 0.09 |
| 85+ | 1.80 | 2.26 | 0.46 |
| total | 4.23 | 3.76 | -0.46 |

| FEMALE | (1) - 1991 - | (2) - 1996 - | (3=2-1) Change in Net Undercount |
|---|---|---|---|
| 0-4 | 2.58 | 3.22 | 0.64 |
| 5-9 | 2.98 | 1.43 | -1.55 |
| 10-14 | 2.18 | 0.62 | -1.56 |
| 15-19 | 4.26 | 2.22 | -2.04 |
| 20-24 | 7.26 | 4.63 | -2.63 |
| 25-29 | 5.31 | 5.03 | -0.28 |
| 30-34 | 3.16 | 2.88 | -0.28 |
| 35-39 | 2.07 | 2.03 | -0.04 |
| 40-44 | 2.10 | 1.39 | -0.70 |
| 45-49 | 1.67 | 1.42 | -0.25 |
| 50-54 | 1.03 | 1.69 | 0.66 |
| 55-59 | 1.59 | 2.68 | 1.10 |
| 60-64 | 1.79 | 1.05 | -0.75 |
| 65-69 | 2.10 | 2.09 | 0.00 |
| 70-74 | 2.13 | 1.70 | -0.43 |
| 75-79 | 2.09 | 0.67 | -1.42 |
| 80-84 | 2.05 | 2.88 | 0.83 |
| 85-89 | 1.73 | 0.11 | -1.62 |
| 90+ | | | |
| total | 2.98 | 2.27 | -0.71 |

| both sexes | 3.60 | 3.01 | -0.59 |

[1] Random additions are added to estimates of net undercount in both years, and independent estimates
 of incompletely or partially enumerated Indian Reserves are added to net undercount in 1996

Table 12.   Estimated Net Undercount and Errors of Closure by Age/Sex, Preliminary Results

| MALE | (1) Published Census Figure | (2) 1996 net | (3) 1996 net undercount rate | (4) Indian Reserves | (5=1+2+4) 1996 RRC Adj Total | (6) 1996 post censal estimate | (7=5-6) Error of closure | (8=7/5*100) Error of closure (%) |
|---|---|---|---|---|---|---|---|---|
| 0-4 | 982,561 | 20,069 | 2.00 | 2,963 | 1,005,593 | 998,111 | -7,482 | -0.74 |
| 5-9 | 1,019,289 | 6,540 | 0.64 | 2,778 | 1,028,607 | 1,029,642 | 1,035 | 0.10 |
| 10-14 | 1,023,363 | 4,481 | 0.44 | 2,421 | 1,030,265 | 1,030,194 | -71 | -0.01 |
| 15-19 | 1,003,352 | 25,947 | 2.52 | 2,194 | 1,031,493 | 1,024,653 | -6,840 | -0.66 |
| 20-24 | 951,826 | 75,718 | 7.37 | 1,786 | 1,029,330 | 1,031,755 | 2,425 | 0.24 |
| 25-29 | 1,005,283 | 93,203 | 8.48 | 1,863 | 1,100,349 | 1,120,003 | 19,654 | 1.79 |
| 30-34 | 1,221,683 | 83,385 | 6.39 | 1,769 | 1,306,837 | 1,332,360 | 25,523 | 1.95 |
| 35-39 | 1,258,014 | 61,695 | 4.67 | 1,493 | 1,321,202 | 1,342,212 | 21,010 | 1.59 |
| 40-44 | 1,144,996 | 33,082 | 2.81 | 1,190 | 1,179,268 | 1,190,086 | 10,818 | 0.92 |
| 45-49 | 1,040,833 | 27,110 | 2.54 | 177 | 1,068,120 | 1,083,078 | 14,958 | 1.40 |
| 50-54 | 806,683 | 8,275 | 1.02 | 772 | 815,730 | 836,912 | 21,182 | 2.60 |
| 55-59 | 643,448 | 12,606 | 1.92 | 788 | 656,842 | 661,096 | 4,254 | 0.65 |
| 60-64 | 580,871 | 14,592 | 2.45 | 605 | 596,068 | 595,931 | -137 | -0.02 |
| 65-69 | 523,070 | 8,509 | 1.60 | 562 | 532,141 | 535,875 | 3,734 | 0.70 |
| 70-74 | 420,295 | 3,587 | 0.85 | 386 | 424,268 | 433,047 | 8,779 | 2.07 |
| 75-79 | 276,934 | 4,128 | 1.47 | 311 | 281,373 | 288,690 | 7,317 | 2.60 |
| 80-84 | 167,247 | 2,676 | 1.57 | 182 | 170,105 | 174,371 | 4,266 | 2.51 |
| 85+ | 100,278 | 1,868 | 1.83 | 145 | 102,291 | 109,299 | 7,008 | 6.85 |
| TOTAL | 14,170,026 | 487,471 | 3.33 | 22,385 | 14,679,882 | 14,817,315 | 137,433 | 0.94 |

| FEMALE | (1) Published Census Figure | (2) 1996 net | (3) 1996 net undercount rate | (4) Indian Reserves | (5=1+2+4) 1996 RRC Adj Total | (6) 1996 post censal estimate | (7=5-6) Error of closure | (8=7/5*100) Error of closure (%) |
|---|---|---|---|---|---|---|---|---|
| 0-4 | 935,263 | 26,209 | 2.73 | 2,730 | 964,202 | 949,210 | -14,992 | -1.55 |
| 5-9 | 970,725 | 9,506 | 0.97 | 2,561 | 982,792 | 982,877 | 85 | 0.01 |
| 10-14 | 970,077 | 1,753 | 0.18 | 2,309 | 974,139 | 986,009 | 11,870 | 1.22 |
| 15-19 | 955,768 | 17,591 | 1.81 | 1,935 | 975,294 | 975,013 | -281 | -0.03 |
| 20-24 | 946,225 | 40,846 | 4.14 | 1,825 | 988,896 | 1,001,456 | 12,560 | 1.27 |
| 25-29 | 1,025,393 | 48,702 | 4.53 | 1,814 | 1,075,909 | 1,100,812 | 24,903 | 2.31 |
| 30-34 | 1,246,552 | 31,323 | 2.45 | 1,794 | 1,279,669 | 1,295,736 | 16,067 | 1.26 |
| 35-39 | 1,286,018 | 21,627 | 1.65 | 1,438 | 1,309,083 | 1,320,628 | 11,545 | 0.88 |
| 40-44 | 1,172,677 | 12,298 | 1.04 | 1,080 | 1,186,055 | 1,193,960 | 7,905 | 0.67 |
| 45-49 | 1,053,018 | 11,091 | 1.04 | 914 | 1,065,023 | 1,072,569 | 7,546 | 0.71 |
| 50-54 | 809,863 | 10,495 | 1.28 | 689 | 821,047 | 832,495 | 11,448 | 1.39 |
| 55-59 | 658,260 | 15,130 | 2.25 | 560 | 673,950 | 669,473 | -4,477 | -0.66 |
| 60-64 | 606,878 | 3,504 | 0.57 | 528 | 610,910 | 616,366 | 5,456 | 0.89 |
| 65-69 | 582,873 | 9,434 | 1.59 | 336 | 592,643 | 592,290 | -353 | -0.06 |
| 70-74 | 535,697 | 6,439 | 1.19 | 281 | 542,417 | 546,416 | 3,999 | 0.74 |
| 75-79 | 401,315 | 519 | 0.13 | 193 | 402,027 | 414,780 | 12,753 | 3.17 |
| 80-84 | 283,337 | 6,872 | 2.37 | 126 | 290,335 | 292,239 | 1,904 | 0.66 |
| 85+ | 236,796 | -452 | -0.19 | 68 | 236,412 | 249,455 | 13,043 | 5.52 |
| 90+ |  |  |  |  |  |  |  |  |
| TOTAL | 14,676,735 | 272,887 | 1.83 | 21,181 | 14,970,803 | 15,091,784 | 120,981 | 0.81 |

| total both sexes | 28,846,761 | 760,358 | 2.57 | 43,566 | 29,650,685 | 29,909,099 | 258,414 | 0.87 |

Eng-tabs.xls

Table 13.  Error of Closure, by Age and Sex, 1991 and Preliminary Results on 1996

**MALE**

| | 1991 Error of closure | Error of closure (%) | 1996 Error of closure | Error of closure (%) | change in closure error |
|---|---|---|---|---|---|
| 0-4 | 3,468 | 0.35 | -7,482 | -0.74 | 0.40 |
| 5-9 | -12,871 | -1.29 | 1,035 | 0.10 | -1.19 |
| 10-14 | -7,464 | -0.76 | -71 | -0.01 | -0.75 |
| 15-19 | -16,411 | -1.67 | -6,840 | -0.66 | -1.00 |
| 20-24 | 15,110 | 1.42 | 2,425 | 0.24 | -1.18 |
| 25-29 | 50,579 | 3.94 | 19,654 | 1.79 | -2.16 |
| 30-34 | 11,089 | 0.85 | 25,523 | 1.95 | 1.11 |
| 35-39 | 11,560 | 0.99 | 21,010 | 1.59 | 0.61 |
| 40-44 | -12,752 | -1.18 | 10,818 | 0.92 | -0.27 |
| 45-49 | 8,308 | 0.98 | 14,958 | 1.40 | 0.42 |
| 50-54 | -2,587 | -0.38 | 21,182 | 2.60 | 2.21 |
| 55-59 | -7,259 | -1.17 | 4,254 | 0.65 | -0.53 |
| 60-64 | 289 | 0.05 | -137 | -0.02 | -0.03 |
| 65-69 | -6,971 | -1.40 | 3,734 | 0.70 | -0.70 |
| 70-74 | -3,053 | -0.84 | 8,779 | 2.07 | 1.23 |
| 75-79 | -226 | -0.09 | 7,317 | 2.60 | 2.51 |
| 80-84 | 480 | 0.34 | 4,266 | 2.51 | 2.17 |
| 85+ | -601 | -0.97 | 7,008 | 6.85 | 5.88 |
| | 30,688 | 0.22 | 137,433 | 0.94 | 0.72 |

**FEMALE**

| | 1991 Error of closure | Error of closure (%) | 1996 Error of closure | Error of closure (%) | change in closure error |
|---|---|---|---|---|---|
| 0-4 | 2,498 | 0.26 | -14,992 | -1.55 | 1.29 |
| 5-9 | -20,262 | -2.12 | 85 | 0.01 | -2.11 |
| 10-14 | -11,555 | -1.24 | 11,870 | 1.22 | -0.02 |
| 15-19 | -13,943 | -1.48 | -281 | -0.03 | -1.45 |
| 20-24 | -3,107 | -0.30 | 12,560 | 1.27 | 0.97 |
| 25-29 | 37,749 | 3.03 | 24,903 | 2.31 | -0.71 |
| 30-34 | 10,359 | 0.81 | 16,067 | 1.26 | 0.45 |
| 35-39 | 18,570 | 1.59 | 11,545 | 0.88 | -0.70 |
| 40-44 | -11,711 | -1.10 | 7,905 | 0.67 | -0.44 |
| 45-49 | 528 | 0.06 | 7,546 | 0.71 | 0.64 |
| 50-54 | -1,348 | -0.20 | 11,448 | 1.39 | 1.19 |
| 55-59 | 1,427 | 0.23 | -4,477 | -0.66 | 0.43 |
| 60-64 | 6,001 | 0.98 | 5,456 | 0.89 | -0.09 |
| 65-69 | -2,946 | -0.50 | -353 | -0.06 | -0.44 |
| 70-74 | 2,578 | 0.55 | 3,999 | 0.74 | 0.19 |
| 75-79 | 4,591 | 1.25 | 12,753 | 3.17 | 1.92 |
| 80-84 | 4,197 | 1.75 | 1,904 | 0.66 | -1.09 |
| 85+ | 3,408 | 2.62 | 13,043 | 5.52 | 2.90 |
| | 27,034 | 0.19 | 120,981 | 0.81 | 0.62 |

| Total | 57,722 | 0.21 | 258,414 | 0.87 | 0.67 |

57722                                258414

Table 14. Error of Closure, by Broad Age Group and Sex, 1991-1996

| Male | - 1991 - Error of Closure | Error of Closure (%) | - 1996 - Error of Closure | Error of Closure (%) |
|---|---|---|---|---|
| 0-19 | -33,278 | -0.84 | -13,358 | -0.33 |
| 20-39 | 88,338 | 1.83 | 68,612 | 1.44 |
| 40+ | -24,372 | -0.48 | 82,179 | 1.41 |
| Total | 30,688 | 0.22 | 137,433 | 0.94 |
| | | | | |
| Female | | | | |
| 0-19 | -43,262 | -1.15 | -3,318 | -0.09 |
| 20-39 | 63,571 | 1.34 | 65,075 | 1.40 |
| 40+ | 6,725 | 0.12 | 59,224 | 0.92 |
| Total | 27,034 | 0.19 | 120,981 | 0.81 |
| | | | | |
| both sexes | 57,722 | 0.21 | 258,414 | 0.87 |

Table 15.   Estimate of Emigrants by Province, 1991-1996.

| province/territory | Demography Division | RRC | Standard Errors - 1996 - |
|---|---|---|---|
| Nfld. - T.-N. | -1,364 | -2,111 | 735 |
| P.E.I. - Í.-P.-É. | -389 | -264 | 98 |
| N.S. - N.-É. | -4,122 | -7,577 | 1,731 |
| N.B. - N.-B. | -4,680 | -4,014 | 957 |
| Quebec - Québec | -30,946 | -42,295 | 7,042 |
| Ontario | -96,734 | -146,762 | 15,533 |
| Manitoba | -11,050 | -10,091 | 2,250 |
| Saskatchewan | -4,857 | -6,001 | 1,421 |
| Alberta | -38,455 | -28,589 | 4,539 |
| B.C. - C.-B. | -34,720 | -33,257 | 4,511 |
| Yukon | -329 | -75 | 38 |
| N.W.T. - T.-N.-O. | -378 | -155 | 81 |
| CANADA | -228,025 | -281,192 | 18,530 |

Table 16.  RRC Estimates of Temporarily Abroad, 1991-1996

| province/territory | temporarily abroad 1991 [1] | temporarily abroad 1996 | Standard Errors - 1996 - |
|---|---|---|---|
| Nfld. - T.-N. | 680 | 147 | 147 |
| P.E.I. - Î.-P.-É. | 828 | 214 | 88 |
| N.S. - N.-É. | 1602 | 1756 | 628 |
| N.B. - N.-B. | 0 | 1181 | 527 |
| Quebec - Québec | 21538 | 30374 | 6900 |
| Ontario | 26051 | 68991 | 10502 |
| Manitoba | 3208 | 4072 | 1248 |
| Saskatchewan | 4194 | 2958 | 970 |
| Alberta | 13210 | 18692 | 3900 |
| B.C. - C.-B. | 13246 | 24768 | 3675 |
| Yukon | 154 | 151 | 51 |
| N.W.T. - T.-N.-O. | 203 | 241 | 97 |
| CANADA | 84914 | 153545 | 13778 |

[1]  Standard Errors for 1991 are not currently available, although are expected to be of
     comparable magnitude to 1996 figures

Table 17   Impact of Changes in Methodology of the Coverage Studies on Closure Error, by Province/Territory

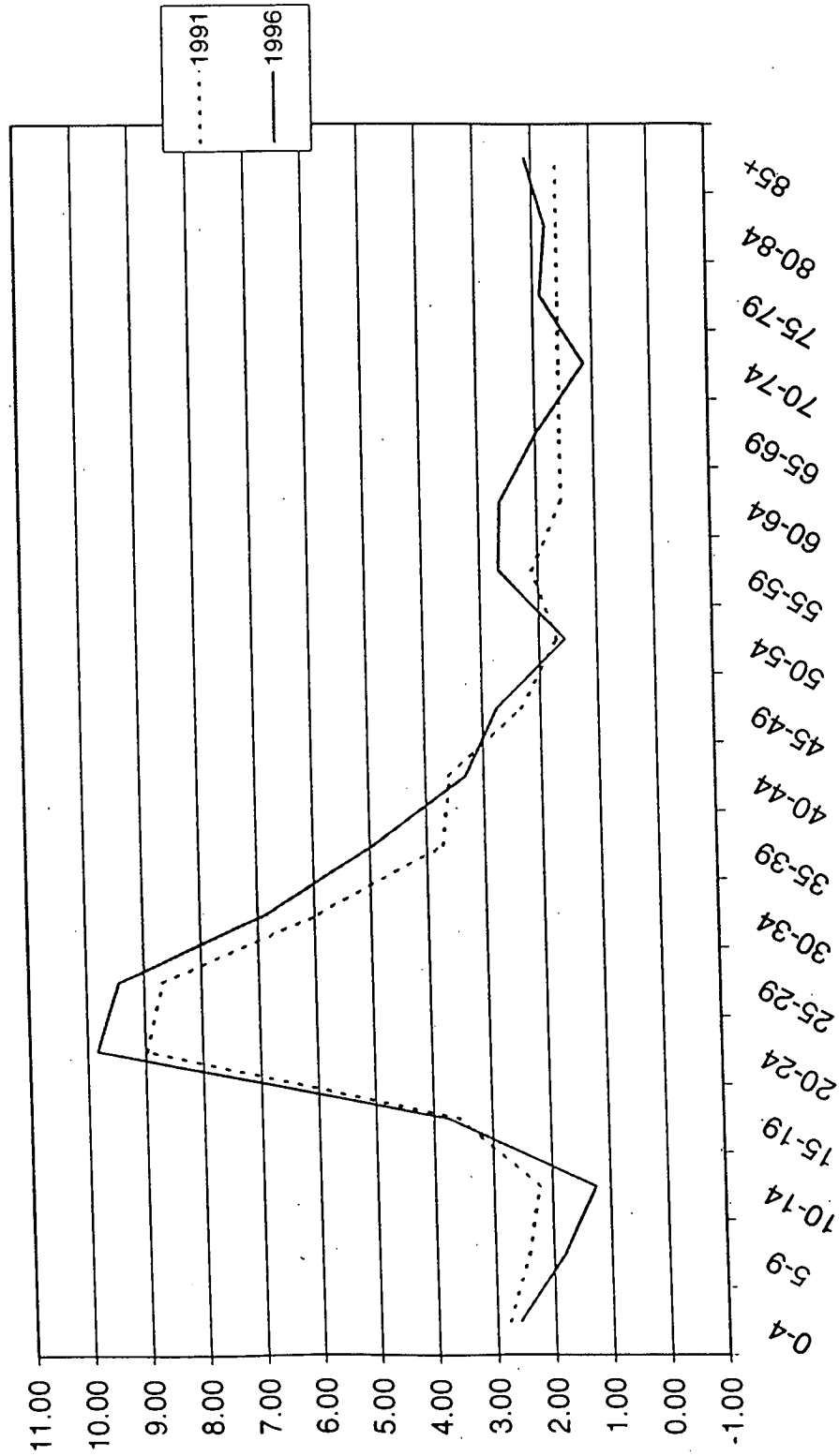| | Initial Error of Closure | | Error of Closure After Revision for Monster Match [1] | | Error of Closure After Revision for Overcoverage [2] | | Error of Closure Combined Impact of Overcoverage and Monster Match | |
|---|---|---|---|---|---|---|---|---|
| | Error of Closure | error of closure (%) | Error of Closure | error of closure (%) | Error of Closure | error of closure (%) | Error of Closure | error of closure (%) |
| Nfld | 8845 | 1.58 | 8741 | 1.56 | 7064 | 1.26 | 6960 | 1.24 |
| PEI | 581 | 0.43 | 483 | 0.36 | 177 | 0.13 | 79 | 0.06 |
| NS | 10632 | 1.14 | 8541 | 0.92 | 8871 | 0.95 | 6780 | 0.73 |
| NB | 7634 | 1.01 | 5605 | 0.74 | 6632 | 0.88 | 4603 | 0.61 |
| Que | 121021 | 1.66 | 108223 | 1.49 | 96650 | 1.33 | 83852 | 1.15 |
| Ont | 153651 | 1.38 | 132079 | 1.19 | 139405 | 1.26 | 117833 | 1.06 |
| Man | 2312 | 0.20 | 1008 | 0.09 | -2790 | -0.25 | -4094 | -0.36 |
| Sask | -2289 | -0.22 | -3474 | -0.34 | -4542 | -0.45 | -5727 | -0.56 |
| Alb | 5790 | 0.21 | -3627 | -0.13 | 1866 | 0.07 | -7551 | -0.27 |
| BC | -48246 | -1.24 | -50889 | -1.31 | -59275 | -1.53 | -61918 | -1.60 |
| Yukon | -663 | -2.08 | -684 | -2.14 | -784 | -2.46 | -805 | -2.52 |
| NWT | -852 | -1.26 | -929 | -1.38 | -1500 | -2.22 | -1577 | -2.34 |
| total | 258416 | 0.87 | 205077 | 0.69 | 191776 | 0.65 | 138437 | 0.47 |

[1] The 1991 Monster match demonstrated that 53,339 persons too many were classified as missed, when in actual fact they were enumerated.

[2] Methodological enhancements have apparently increased the number of persons documented as overcoverage through the coverage studies. This revision, by province/territory, merely assumes that the same level of overcoverage as documented in 1996 was also in the 1991 Census, by province/territc
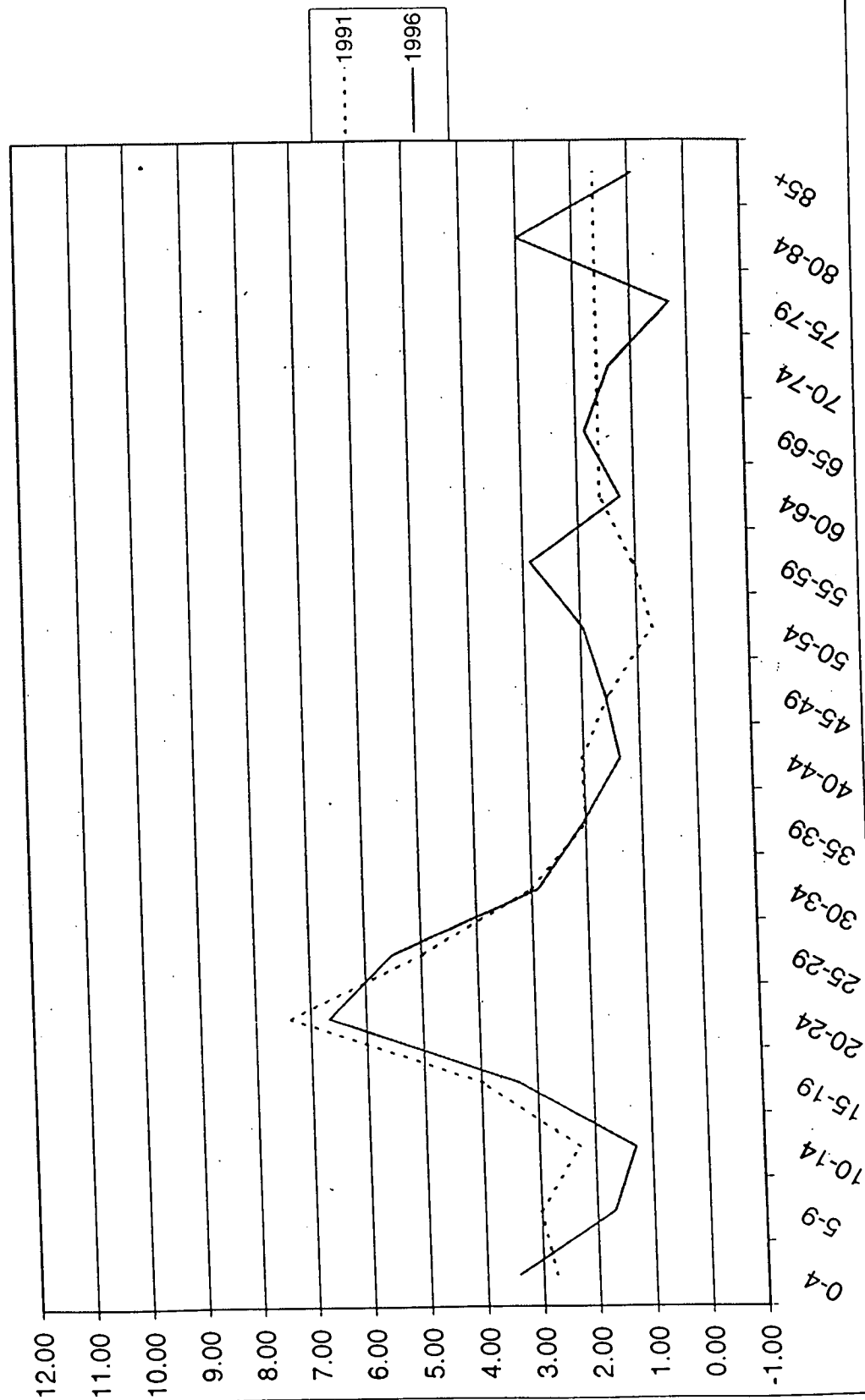
tables for report data as of end feb 1998

# Figure 1  RRC Based Estimates of Gross Undercoverage, by 5-year Age Group, 1991-1996, Males



Legend:
- ······ 1991
- —— 1996

Y-axis: 11.00, 10.00, 9.00, 8.00, 7.00, 6.00, 5.00, 4.00, 3.00, 2.00, 1.00, 0.00, -1.00

X-axis (age groups): 0-4, 5-9, 10-14, 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, 65-69, 70-74, 75-79, 80-84, 85+

tables for report data as of end ffeb 1998

Figure 2  RRC Based Estimates of Gross Undercoverage, by 5-year Age Groups, 1991-1996, Females

tables for report feb 1998

Figure 3 RRC Based Estimates of Gross Overcoverage, by 5-year Age Groups, 1991-1996 Males

tables for report feb 1998
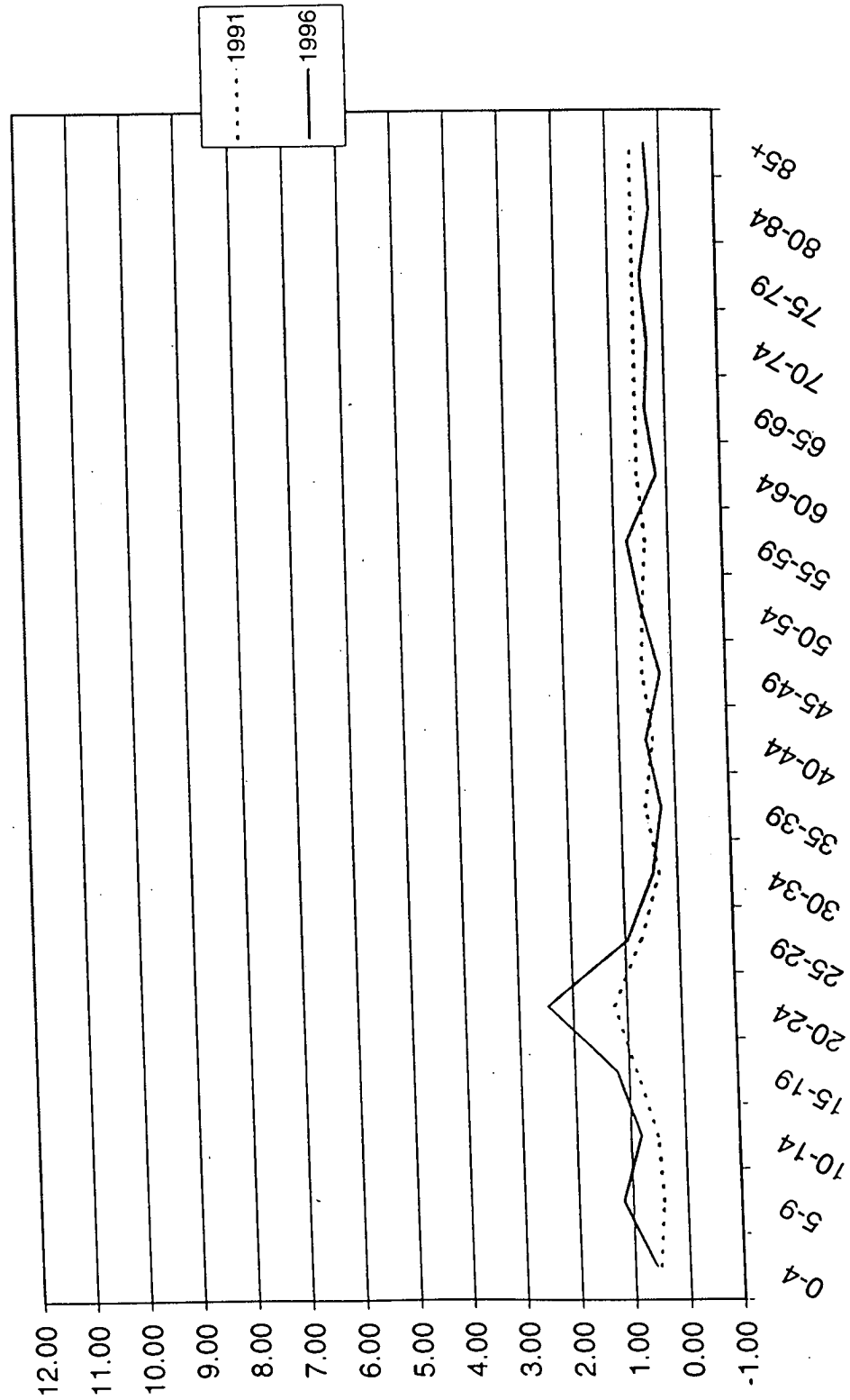
# Figure 4 RRC Based Estimates of Gross Overcoverage, by 5-year Age Group; 1991-1996, Females



tables for report Feb 1998
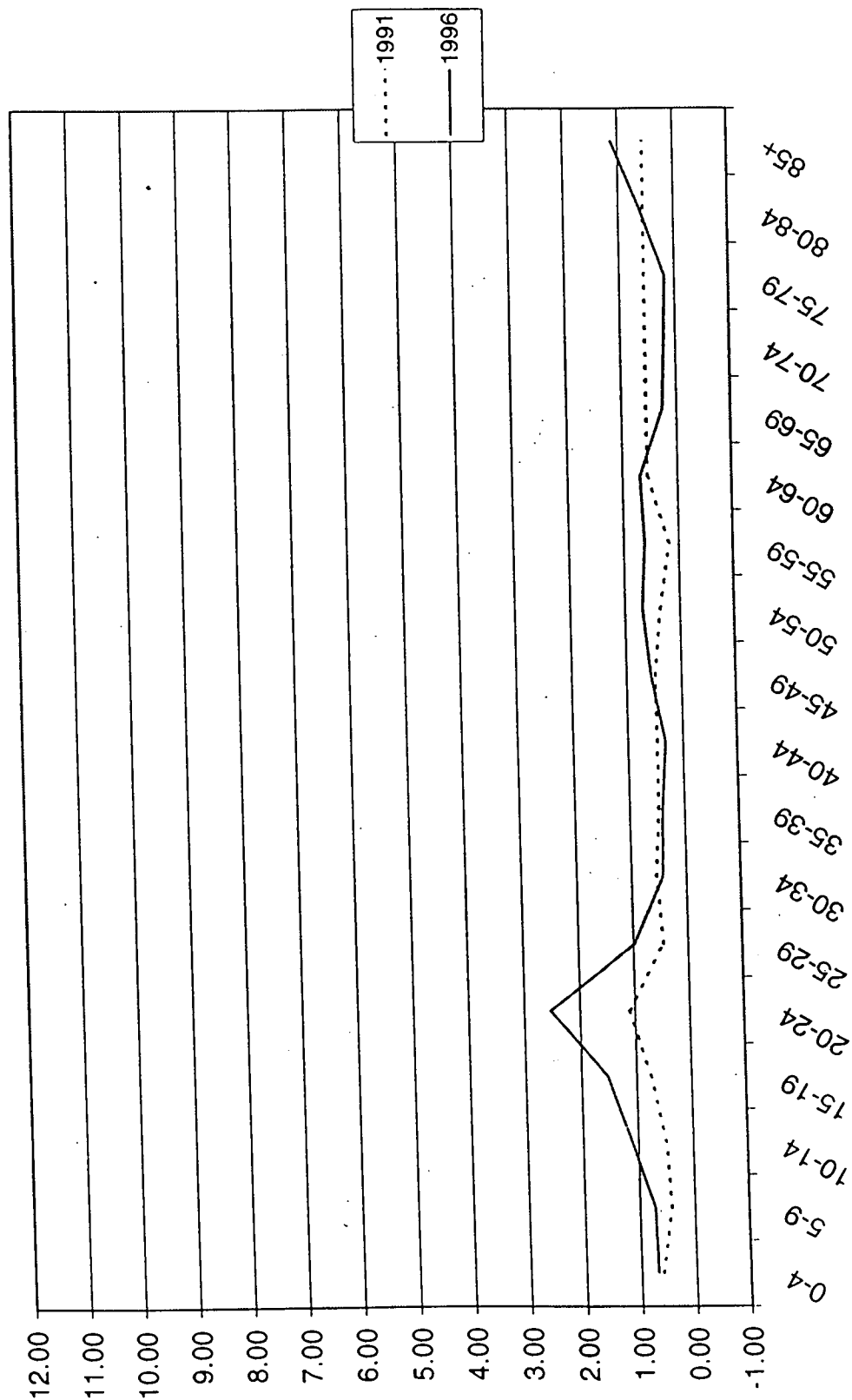
# Figure 5  RRC Based Estimates of Net Undercount, by 5-year Age Groups, 1991-1996, Males



tables for report feb 1998
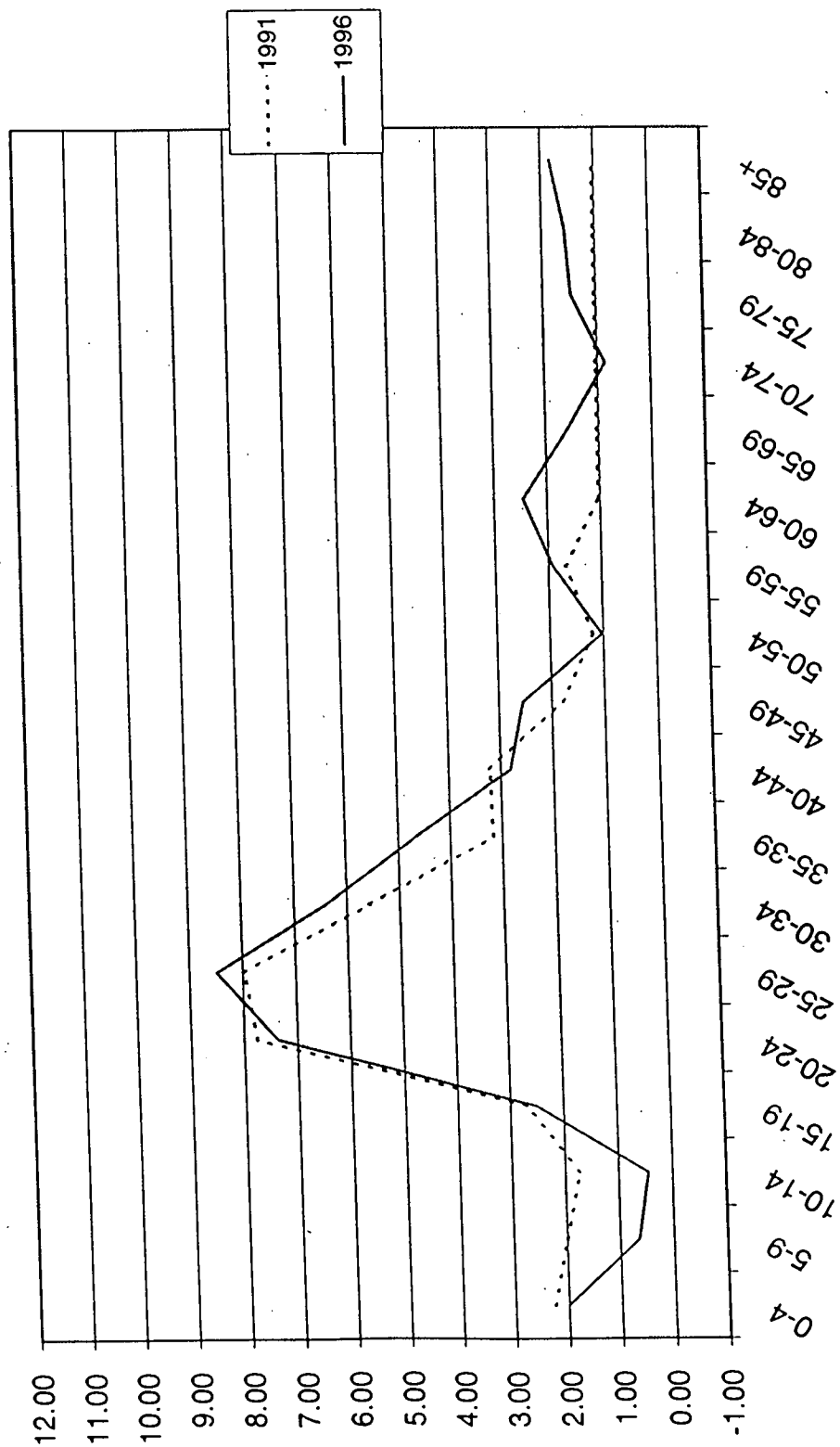
# Figure 6 RRC Based Estimates of Net Undercount, by 5-year Age Groups, 1991-1996, Females



tables for report feb 1998
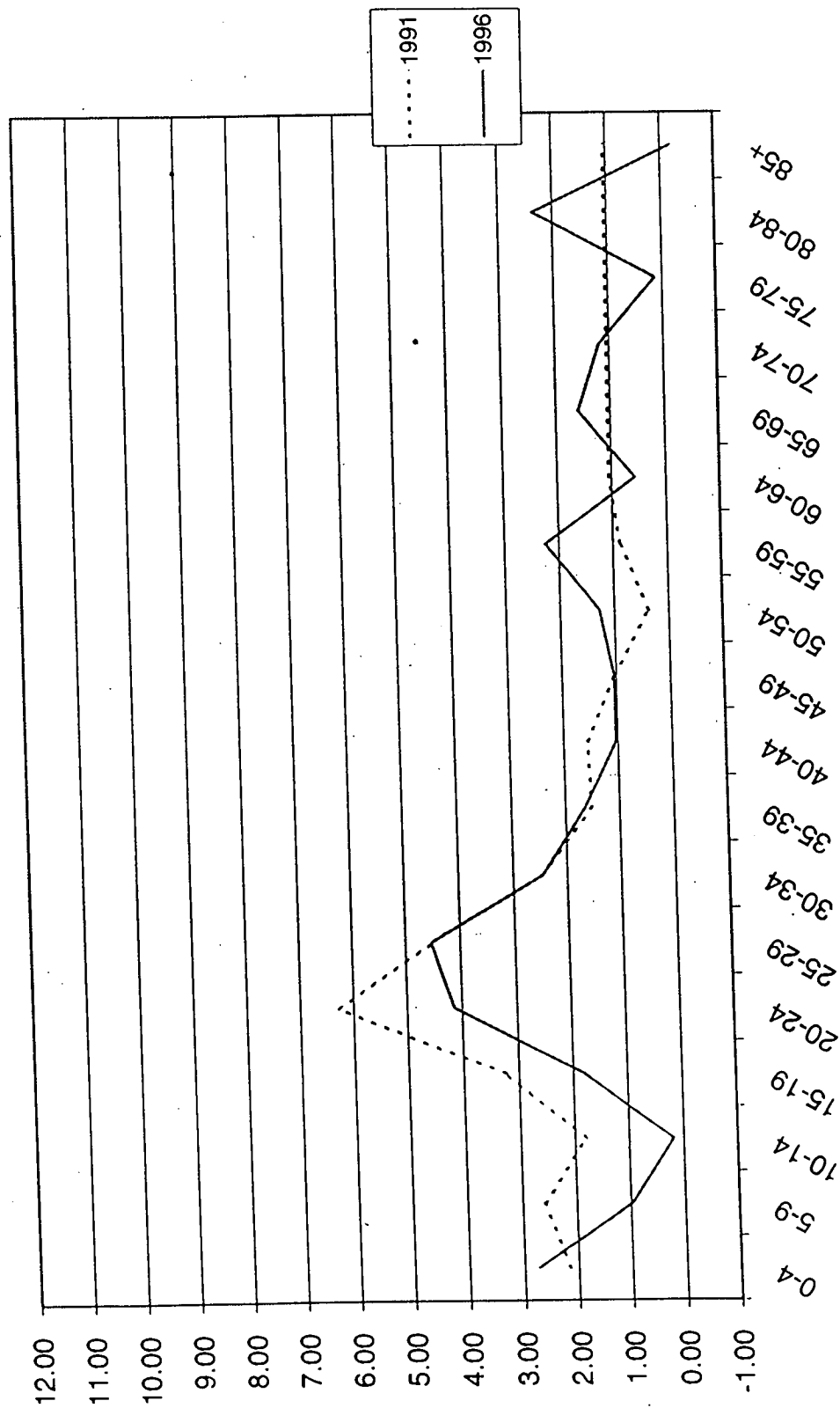
Figure 7 RCC Based Estimates of Net Undercount (All Coverage Studies Combined, Including Random Additions and Incompletely Enumerated Indian Reserves), 1991-1996, Males
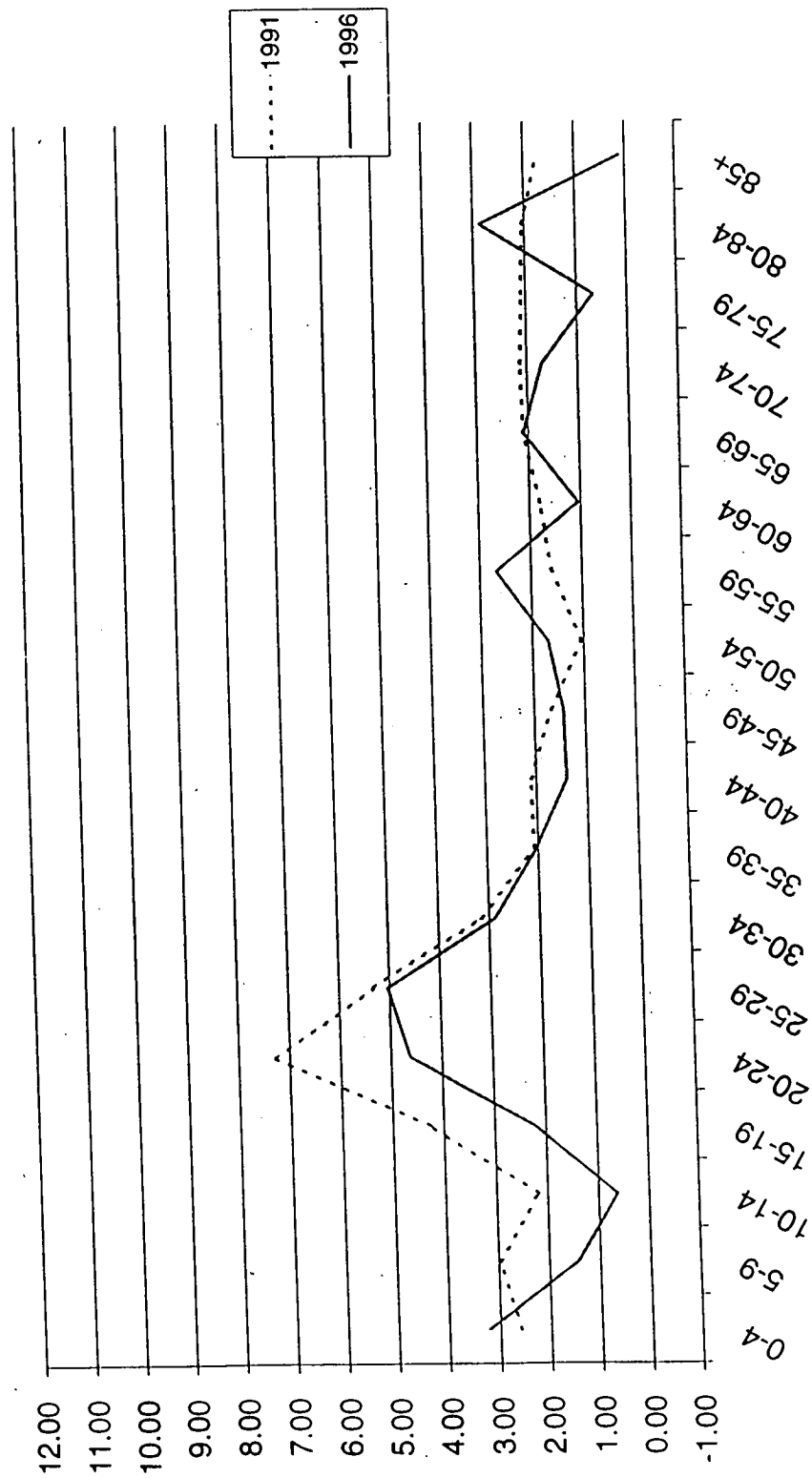
tables for report feb 1998
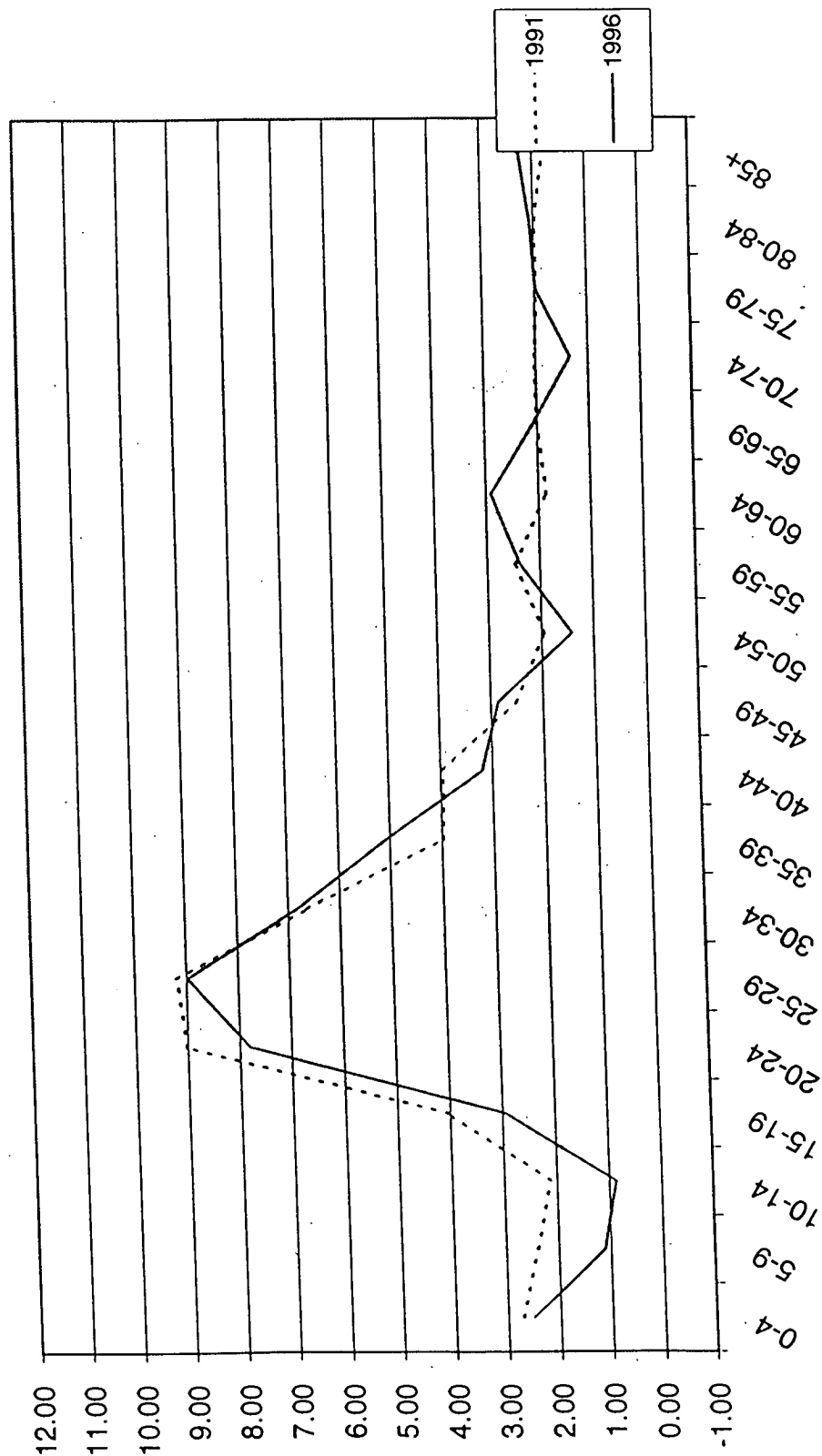
Figure 8 RRC Based Estimates of Net Undercount (All Coverage Studies Combined, Including Random Additions and Incompletely Enumerated Indian Reserves), 1991-1996, Females

tables for report feb 1998

Chart 9. Net Undercount, by Broad Age Groups and Sex, 1991-1996
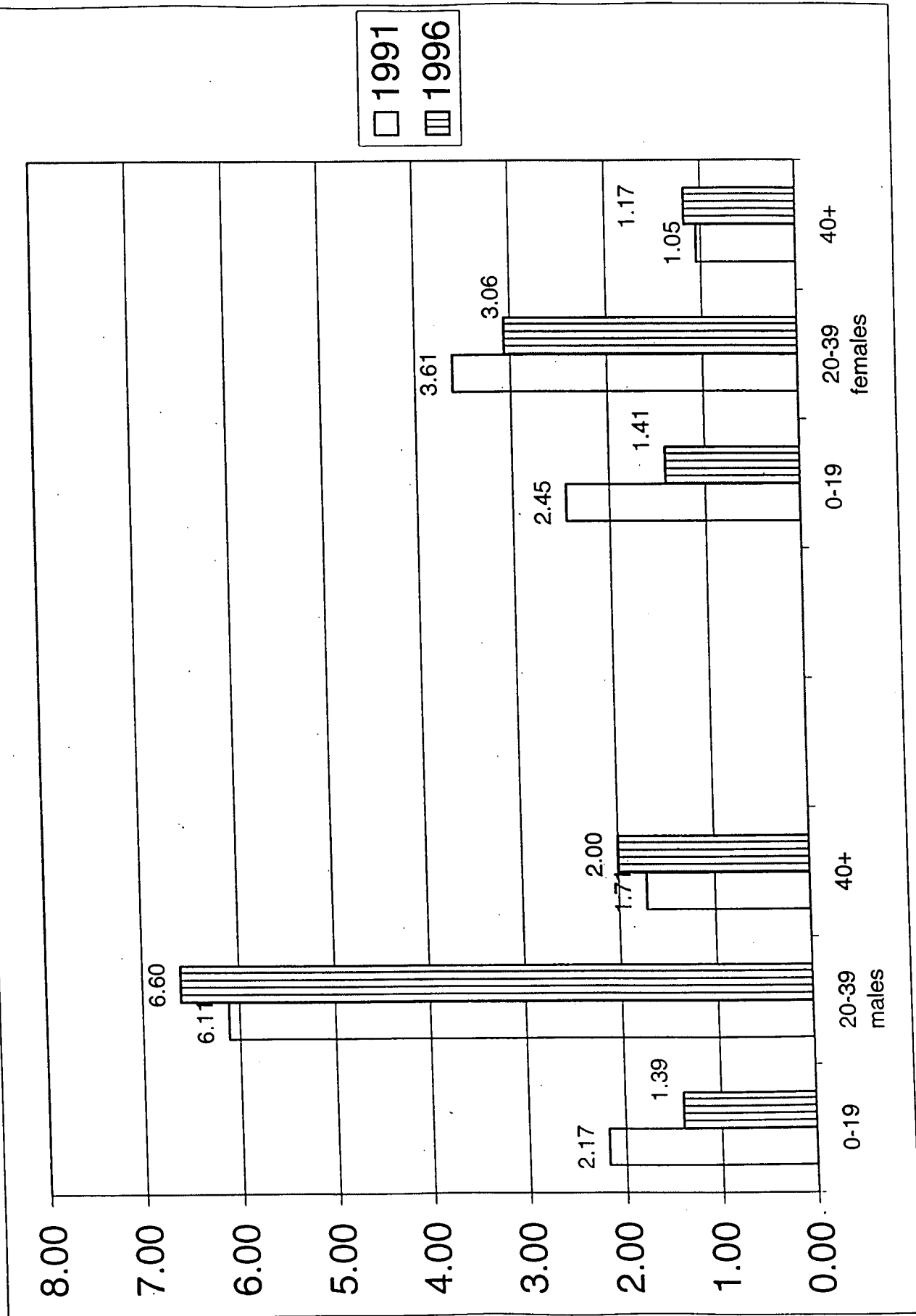


table for report data as of end Feb 1998

Chart 10. Net Undercount (results from all Coverage Studies Combined, including Random Additions and Incompletely Enumerated Indian Reserves) Broad Age Group and Sex, 1991-1996
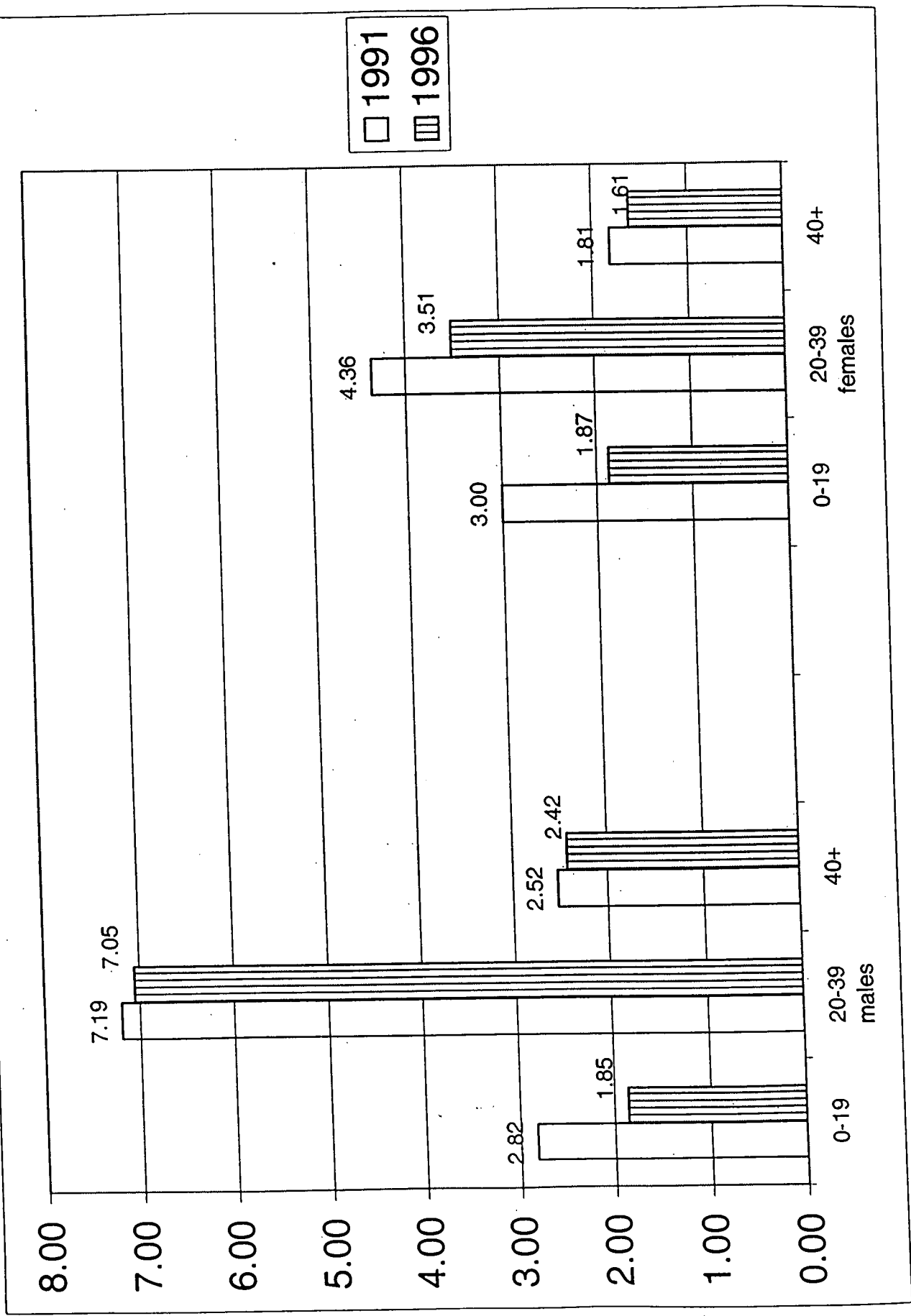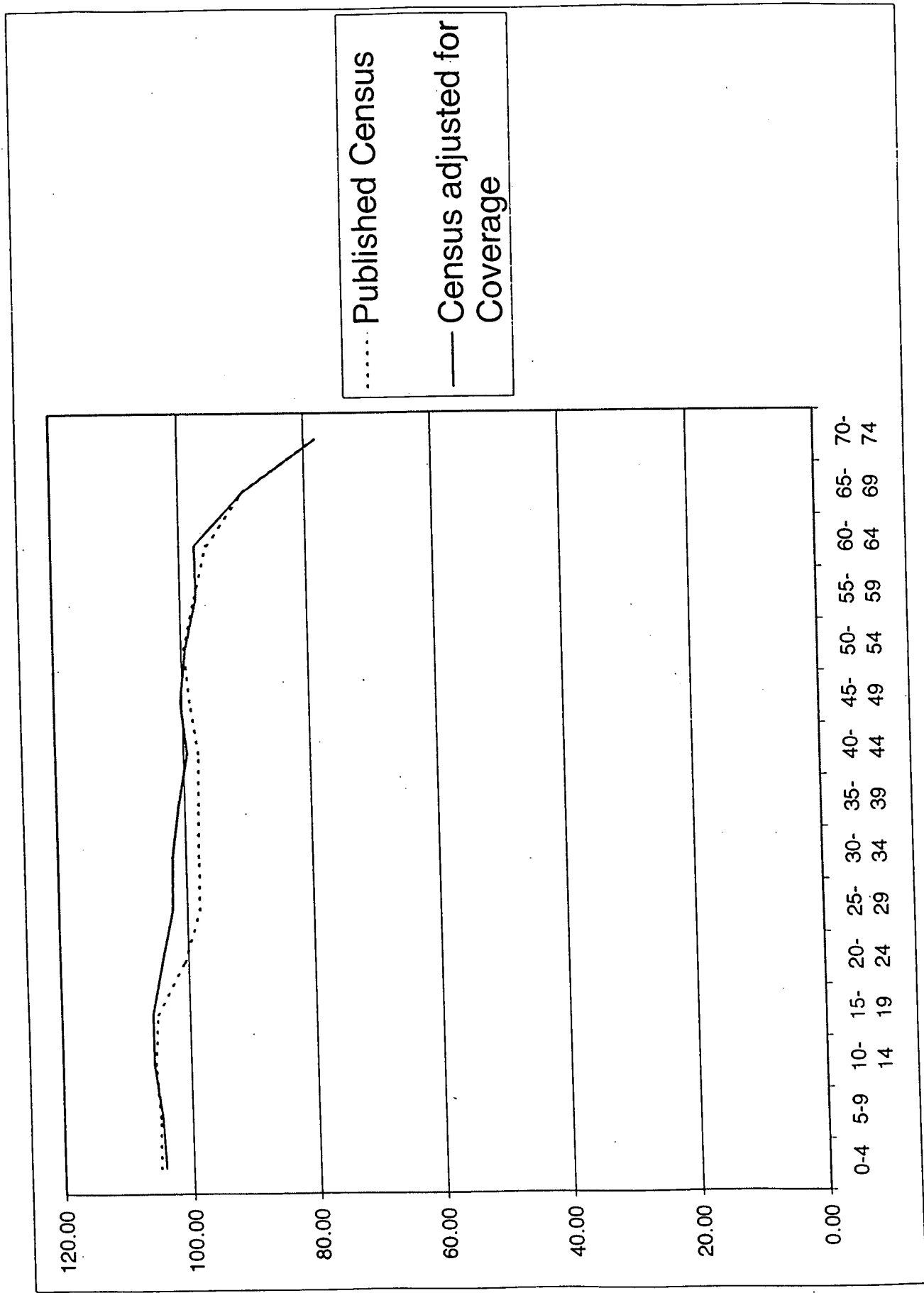


Tables for report data end of Feb 1998

Chart 11.   Sex Ratios, by 5-Year Age Groups, Published Census and Fully Adjusted Census, 1996



Legend:
...... Published Census
——— Census adjusted for Coverage

tables for report data as of end feb 1998

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