INTRODUCTION

Background: The common practice in population-based cancer survival analyses is to include only the first primary cancer diagnosis and exclude any subsequent primaries for an individual. However, several recent studies have brought this practice into question and have recommended including all primary cancers. One of the arguments against using only the first primary cancer is that the reference date of a cancer registry's operation affects the registry's ability to identify earlier cancers. A registry with an earlier reference date is more likely to identify previous cancer diagnoses compared to a new registry. Therefore, a tumor that is in fact a subsequent primary might be erroneously treated as a first primary if the registry is not in operation long enough. Based on the first primary rule, such a tumor would be included in the survival calculation in a registry with a later reference date, but would be excluded in an older registry. This selection bias would cause survival comparisons across registries with different reference dates to be less reliable.

Objectives: In this study, we used a theoretical approach to evaluate how and to what extent the length of central cancer registry operations affects the ascertainment of subsequent cancers and consequently on survival estimates, with or without including subsequent cancers.

METHODS

Source of data: All invasive cancer cases (including in situ bladder cancers) diagnosed from 2001 to 2010 in New York State were used for the study.

- Sequence number central (NAACCR data item #380) was used to define first vs. subsequent primary cancers.
- A set of three sequence numbers was created for each tumor. The first sequence number central (NAACCR data item #380) was used to define first vs. subsequent primary for a tumor.
- Five-year relative survival rates were calculated for all sites combined and for 23 major cancer sites, ranging from 3.8% for testis cancer to 20.9% for urinary bladder cancer for the reference year of 1976.

RESULTS

- The percent of tumors classified as subsequent cancers decreased when the registry operation time was shortened. Using the reference year of 1976, 15.3% of cases were classified as subsequent cancer diagnoses, while the percent of subsequent cancers decreased to 14.3% and 11.2%, respectively, for the reference years 1986 and 1996.
- The percent of tumors classified as subsequent primary cancers varied considerably among cancer sites, ranging from 3.8% for testis cancer to 20.9% for urinary bladder cancer for the reference year of 1976, and from 2.8% for tests cancer to 16.3% for kidney and renal pelvis cancer for the reference year of 1996 (Figure 1).

Subsequent primary cancers:

- As expected, median age at diagnosis was always older for the subsequent cancers compared to the first primary cancer.
- The percent of tumors classified as subsequent cancers increased over time regardless of reference year. However, this increase was more rapid for a later reference date (Figure 2).

CONCLUSIONS

The current study showed that the length of registry operations was positively associated with the percentage of tumors classified as subsequent cancer diagnoses.

The overall effect of sequence number misclassification and selection bias on survival estimates was small if the length of registry operations differed by less than 20 years. However, this survival bias could increase when the difference of operation length between registries becomes larger.

Although the survival estimates did not vary greatly between our different reference year assumptions, estimates based only on presumed first cancers does introduce misclassification bias that would be eliminated if the estimates included all cancers. Therefore, inclusion of all primary cancers is recommended.