Incidence, Prevalence, and Mortality of Chronic Lymphocytic Leukemia/Small Lymphocytic Lymphoma (CLL/SLL) in Australia

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INTRODUCTION

- In Western countries, CLL/SLL is the most common type of leukemia in adults, with the median age at diagnosis ranging from 67 to 72 years[1,2]
- The clinical course of CLL/SLL is heterogenous, ranging from asymptomatic disease that does not require treatment for multiple years to rapid progression
- A recent analysis in patients in the US and Germany found that 5-year relative survival rates in 2009 to 2011 were >80% in patients aged <75 years and 65% to 70% in patients aged ≥75 years[3]
- The lack of a cure, association with aging populations, and relatively prolonged survival can increase healthcare burden due to the need for regular monitoring of patients with CLL/SLL[4-6]
- Studies of the incidence, prevalence, and mortality rates of CLL/SLL in Australia are limited
- In this study, we aimed to examine the current epidemiology of CLL/SLL in Australia and predict the 30-year trend of incidence to 2038 and identify the trend of prevalence and mortality from 2009 to 2018

METHODS

- All CLL/SLL cases (*International Statistical Classification of Diseases, Tenth Revision*, codes C83.0/C91.1; *International Classification of Diseases for Oncology* 3.2, histology code 9823) from January 2009 to December 2018 in Victoria, Tasmania, the Australian Capital Territory, and Queensland were extracted from the Australian Cancer Database (ACD)
- Incidence, prevalence, and mortality rates were calculated using methods established by the Australian Institute of Health and Welfare and the epidemiology tool DisMod II
- Least-squares linear regression was used to predict the 30-year trend of incidence (to 2038) and to identify the trend of prevalence and mortality observed over the study period (2009-2018)
- Kaplan-Meier survival curves for overall survival since 2009 were constructed with a maximum follow-up of 10 years
- Hazard ratios (HR) were calculated using a Cox proportional hazards model

RESULTS

CLL/SLL Cases in the ACD

- Data from 9002 CLL/SLL cases were extracted from the ACD (**Figure 1**)
- Most patients were male (62.9%) and aged 60 to 89 years (76.6%)
- Mortality data were available for 2277 patients; the cause of death was most commonly not cancer related (38.8%)
  - Patient information in the ACD is limited, and thus the possible contribution of comorbidities to non–cancer-related deaths could not be determined

Figure 1. Patient Age Group and Sex by Year of Diagnosis

Total percentages by year may not equal 100% due to rounding.
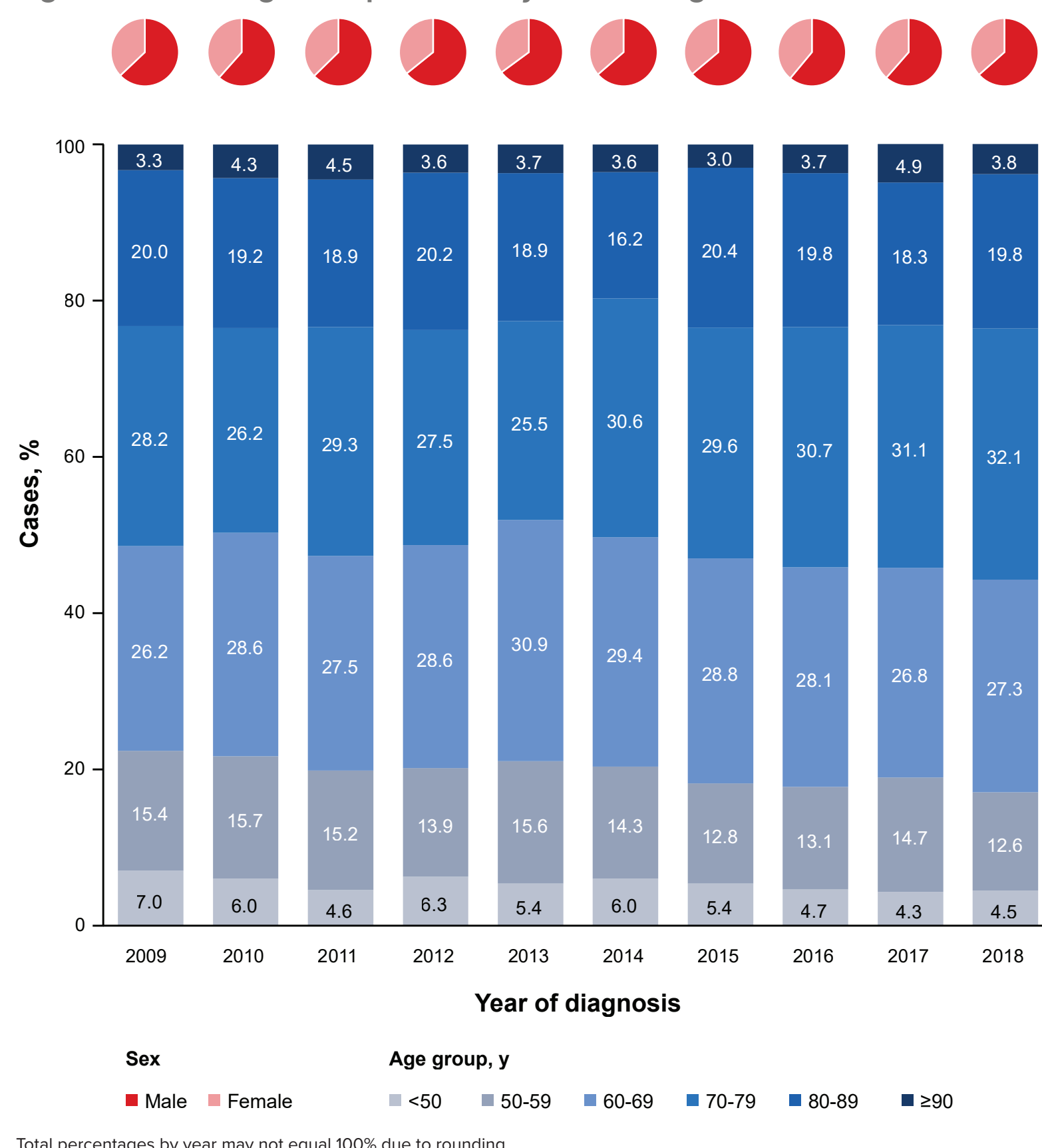
Incidence Rates of CLL/SLL

- Incidence rates of CLL/SLL were relatively stable between 2009 and 2014 before increasing to their peak value in 2017 (**Figure 2**)
- Incidence rates were consistently higher in male patients than in female patients
- Linear regression analyses of data from 2009 to 2018 suggested an increasing incidence rate from 2019 to 2038
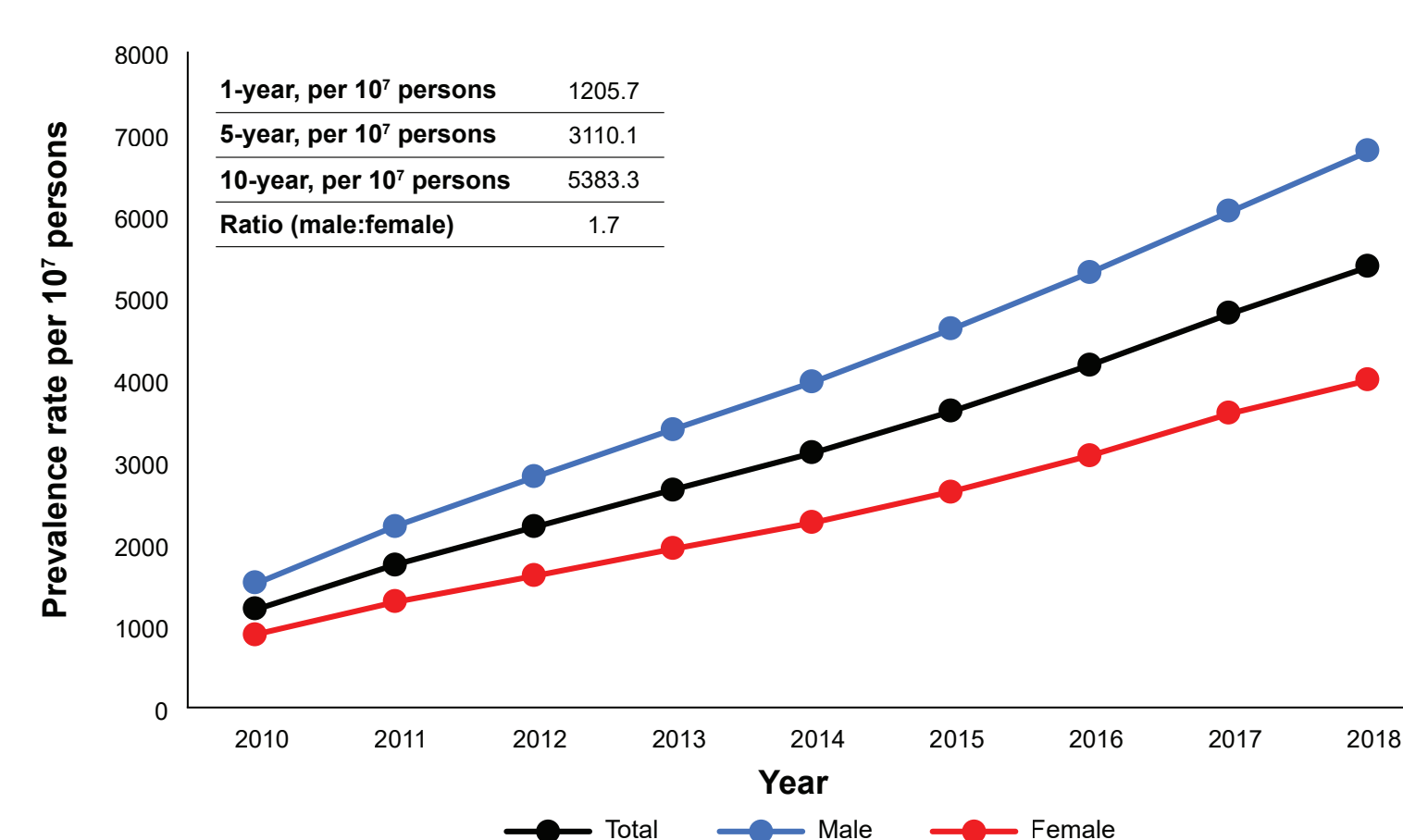
Figure 2. Linear Prediction of Annual CLL/SLL Incidence Rates Over 30 Years (2009-2038)
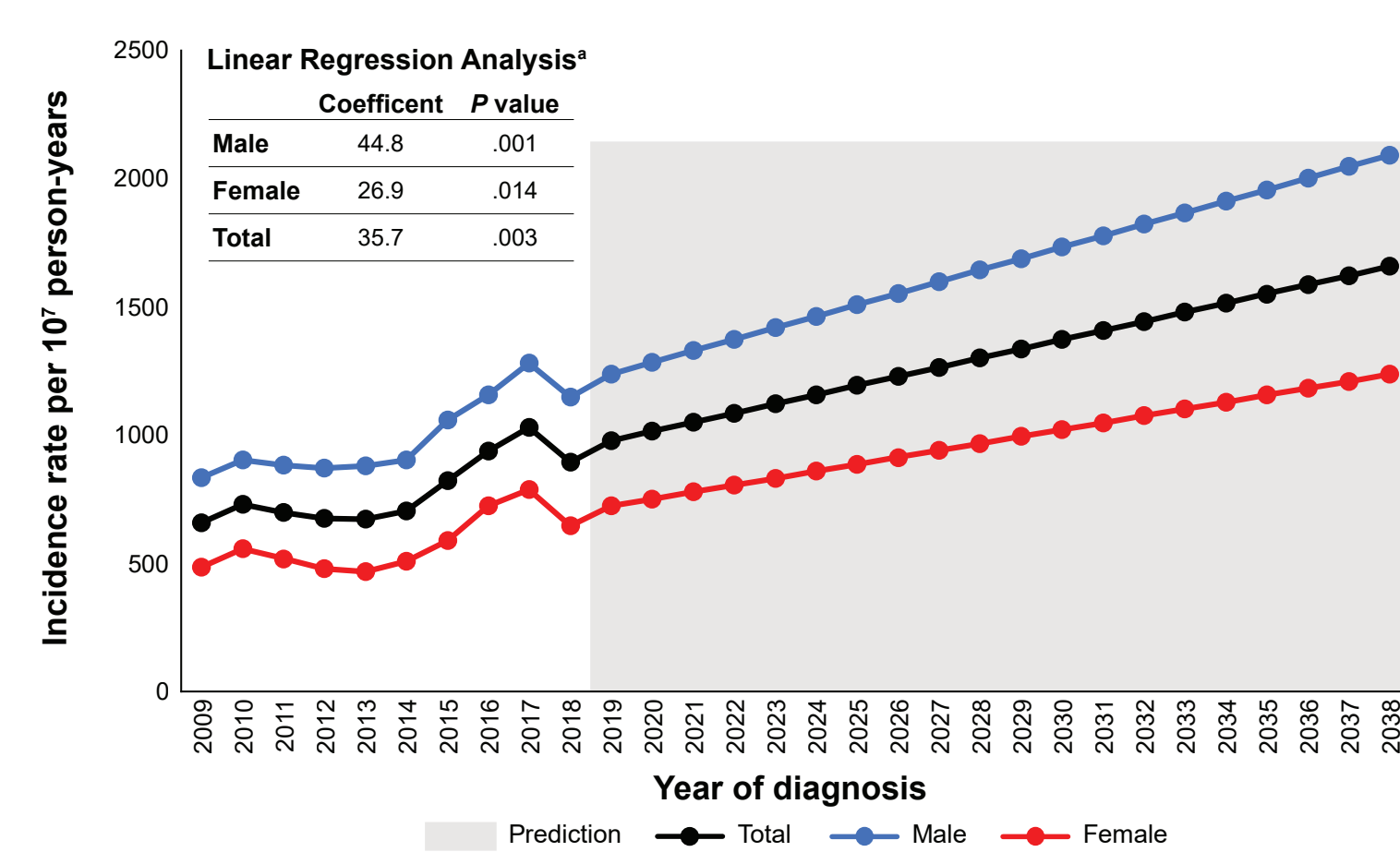
Linear Regression Analysis[a]	Coefficient	*P* value
Male	44.8	.001
Female	26.9	.014
Total	35.7	.003

[a]Coefficients determined by a least-squares linear regression analysis of incidence data from 2009 to 2018. *P*<.05 was considered statistically significant.

Prevalence Rates of CLL/SLL

Figure 3. Observed Prevalence Rates of CLL/SLL From 2010 to 2018

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1-year, per 10[7] persons	1205.7
5-year, per 10[7] persons	3110.1
10-year, per 10[7] persons	5383.3
Ratio (male:female)	1.7

Prevalence rates were calculated using data from the 10-year period of 2009 to 2018.

- The 1-, 5-, and 10-year prevalence rates were ≈1200, ≈3100, and ≈5400 cases per 10[7] persons, respectively (**Figure 3**)
- The prevalence rate was ≈1.7 times greater in male patients than in female patients
- Linear regression analysis indicated a statistically significant ascending trend in prevalence rates over the observed period in both males and females
- The available data were not sufficient to predict the 30-year trend in prevalence rates

Mortality Rates of CLL/SLL

Figure 4. Observed Incidence-Based Mortality Rates From 2010 to 2018

Linear Regression Analysis of the Observed Period[a]	Coefficient	*P* value
Male	30.1	.002
Female	17.5	.001
Total	23.7	.001
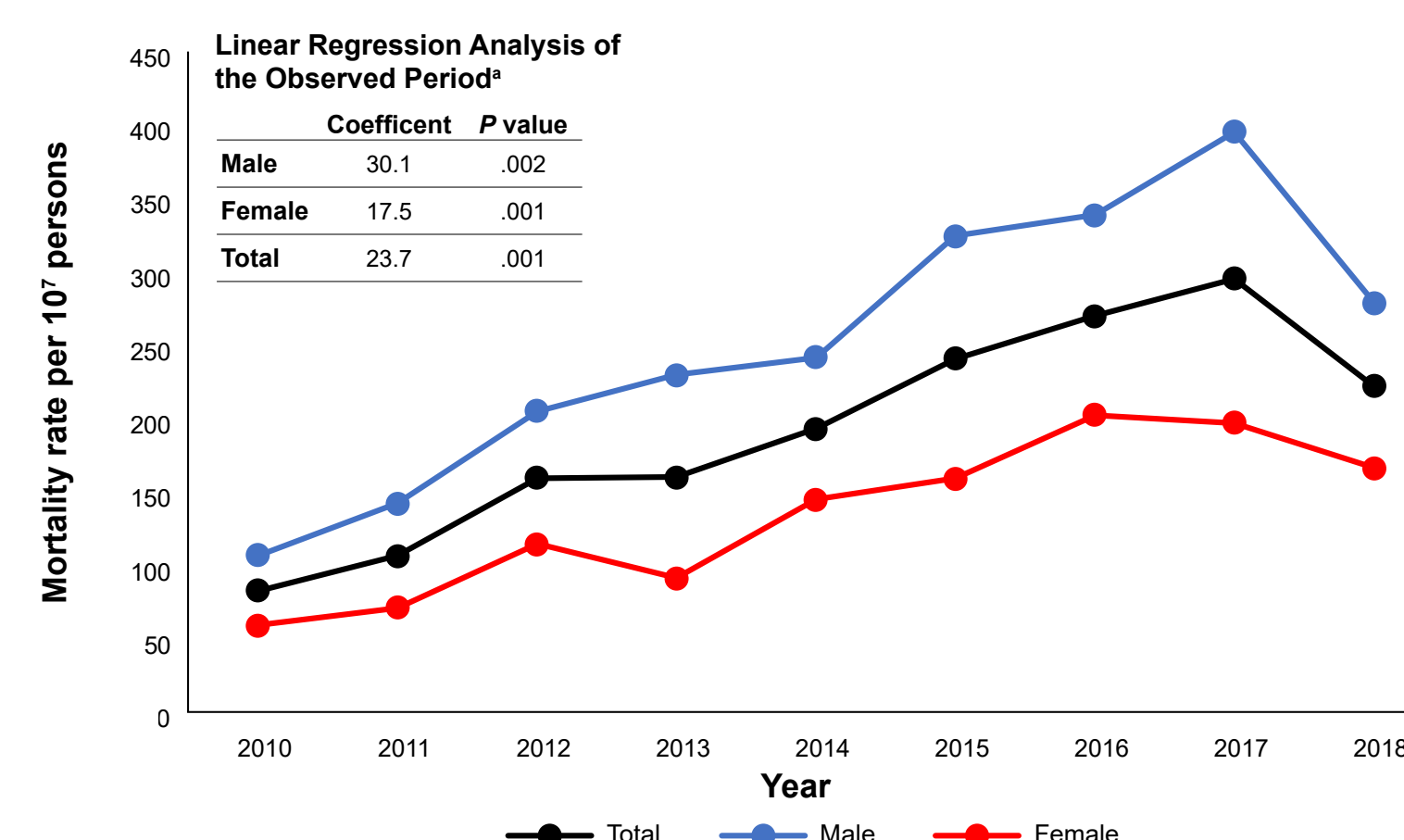
Mortality rates were calculated using data from the 10-year period of 2009 to 2018. However, for precision, the 2009 mortality rate was excluded. The new cases identified in a specific year were assumed to contribute on average a half year of follow-up time for that specific year and a half year for the following year because some may have developed illness in month 1 and others in months 2 through 12 (eg, mid-year June 2009). Correspondingly, new patients in a specific year (eg, 2009) who contributed 0.5 year of follow-up time and died would be counted as mortality cases in that specific year (eg, 2009) and the other half-year mortality cases who contributed a full year of follow-up time would be counted for the following year (ie, 2010).
[a]Coefficients determined by a least-squares linear regression analysis of incidence data from 2009 to 2018. *P*<.05 was considered statistically significant.

- The incidence-based mortality rate from 2010 to 2018 ranged from ≈80 to ≈300 deaths per 10[7] persons, peaking in 2017 (**Figure 4**)
- Mortality rates were lower in female patients than in male patients
- The available data were not sufficient to predict the 30-year trend in mortality rates

CONCLUSIONS

- Using data from 4 Australian cancer registries, we found that the incidence and prevalence of CLL/SLL have generally demonstrated an upward trend while mortality rates showed a decline from 2017 to 2018
- Consistent with findings in prior studies,[3,7,8] patients with CLL/SLL tended to be older and male
- Our linear regression analyses suggested that by 2038, the total incidence rate of CLL/SLL could exceed 1600 cases per 10[7] person-years; however, as this prediction is based on data from 2009 to 2018, current and future treatment options could affect this value, and thus more research is needed
- Patient survival from 2009 to 2018 was significantly poorer in patients aged ≥60 vs those aged <50 years; survival did not significantly differ by patient sex or by year of diagnosis, except for 2015 and 2016, in which survival was significantly better than that in 2009
- Altogether, our findings underscore that management of CLL/SLL in Australia will continue to be an important consideration in assessing the national healthcare system's readiness to serve an aging population in the decades to come

Kaplan-Meier Survival Analyses by Patient Subgroups

Figure 5. Kaplan-Meier Survival Estimates by Sex (A), Age Group (B), and Year of Diagnosis (C)
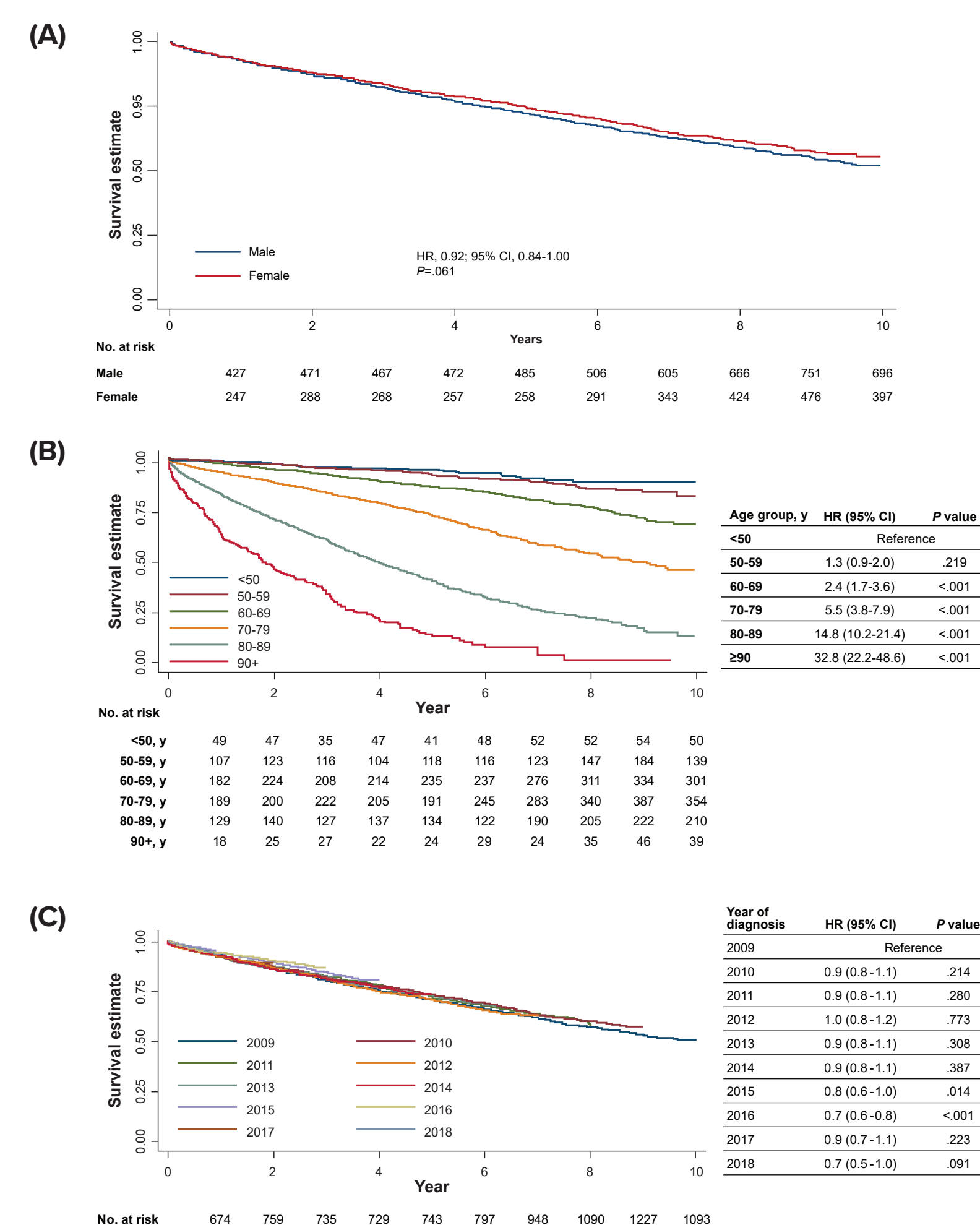
HR, hazard ratio.
Curves were generated by Kaplan-Meier survival analyses and evaluated by the log-rank test (significance at *P*<.05).

- Approximately 53% of patients were alive at the end of the 10-year analysis period (2009-2018)
- Survival did not significantly differ by patient sex (**Figure 5A**; *P*=.061)
- Compared with patients aged <50 years, all age groups ≥60 years had significantly (*P*<.001) poorer survival (**Figure 5B**)
- Analysis of survival by year of diagnosis showed that patients diagnosed in 2015 or 2016 had significantly better survival than those diagnosed in 2009 (**Figure 5C**)

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