Response to the Comments from Reviewer #1.

1.1. Determining that the increase in detection rates is driven by overdiagnosis is very hard to prove - no study design does this robustly. What the authors present is a set of observations which describe the characteristics of the additionally detected cases, which they interpret as being cases which did not require treatment.

Response)
We agree with the reviewer that the increase in detection rates which is driven by overdiagnosis is very hard to prove.
However, in our study, we tried to show that the majority of screen-detection belong to the "overdiagnosis" catergory. Our study showed that screen-detection accounted for two-thirds (66.1%) of total increase in thyroid cancer incidence between 1999 and 2008 in Korea. (Table 2, Figure 3)
In fact, 94.4% of the overall increase in the thyroid cancer incidence was due to the increase of tumours with <20mm size (66.0% of total increase was increase of tumours with <10mm – most of them seems to be clinically insignificant except for anaplastic thyroid carcinoma [1].) and 97.1% of the overall increase was due to the localized (35.5%) and regional (61.6%) SEER summary stage tumours. The 5-year relative survival rates for localized and regional SEER summary stage thyroid cancer was 100.4% and 100.1% [2], respectively, which further support the concept of overdiagnosis in Korea.
Thyroid cancer cases detected by cancer screening do not necessarily mean they do not require treatment. The treatment for thyroid cancer should be decided by histologic type of cancer, cancer stage, clinical or prognostic factor, patient's condition and physician's judgement. However, screen-detected cases are more likely to do not require treatment as compared with clinically detected cases. In our study, we used a pre-designed checklist to sort out the route of tumour detection as described in the medical records, including the circumstances why the patients sought medical attention. All the cases who came for a screening purpose without any thyroid-related symptom were grouped as screen detection and any cases who had records of any thyroid tumour-related symptoms, known history of hypothyroidism or any non-specific complaint such as easy fatigability, axillary discomfort were also grouped as clinical detection.

Reference)
1. National Comprehensive Cancer Network. NCCN Clinical Practice Guidelines in Oncology: Thyroid Carcinoma. V.2.2014.
2. Jung KW, Won YJ, Kong HJ, et al. Survival of Korean adult cancer patients by stage at diagnosis, 2006-2010: national cancer registry study. Cancer Res Treat 2013;45:162-71.

1.2. I would suggest that they think more cautiously about the conclusions - there are some groups where increases have occurred which do not quite fit with this interpretation.

Response)
I agreed with you that some of the increase in thyroid cancer incidence rate may be partially explained by other factors (maybe environmental factors) in other countries.
However, as you can see the below figure, the abrupt increase in the thyroid cancer incidence in Korea is a very exceptional situation as compared with other countries. [1] According to GLOBOCAN 2012, the thyroid cancer ranked as the 17th most common cancer worldwide, [1] while thyroid cancer in Korea ranked as the 1st most common cancer in year 2012.[2] However, thyroid cancer ranked just as the 6th most common cancer in 1999. This increase in the incidence of thyroid cancer in Korea which occurred in both sexes over a very short time span [2-4] is not simply explained by the change in external environmental factors, because the most of thyroid cancer is very slowly progressing tumour if there was no man-made disaster, such as nuclear accident.[5-8]
However, this finding may be not relevant to other countries. Therefore, we deleted a following sentence: "This happens in England and U.S., as well [1, 6, 7]." (Page 19. Line 18)

Figure. International comparison of age-standardized incidence rate for thyroid cancer for selected countries.

Reference)
1. Ferlay J, Soerjomataram I, Ervik M, Dikshit R, Eser S, Mathers C, Rebelo M, Parkin DM, Forman D, Bray, F. GLOBOCAN 2012 v1.0, Cancer Incidence and Mortality Worldwide: IARC CancerBase No. 11 [Internet]. Lyon, France: International Agency for Research on Cancer; 2013. http://globocan.iarc.fr, (accessed 25 February 2016).
2. Jung KW, Won YJ, Kong HJ, et al. Cancer statistics in Korea: incidence, mortality, survival, and prevalence in 2012. Cancer Res Treat 2015;47:127-141.
3. Song H, Go S, Lee WS, et al. Population-Based Regional Cancer Incidence in Korea: Comparison between Urban and Rural Areas. Cancer Res Treat 2015. [Epub ahead of print] DOI: http://dx.doi.org/10.4143/crt.2015.062.
4. Kweon SS, Shin MH, Chung IJ, Kim YJ, Choi JS. Thyroid cancer is the most common cancer in women, based on the data from population-based cancer registries, South Korea. Jpn J Clin Oncol. 2013;43:1039-1046. doi: 10.1093/jjco/hyt102 [doi].
5. Brito, JP and Davies, L. Is there really an increased incidence of thyroid cancer?. Curr Opin Endocrinol Diabetes Obes. 2014; 21: 405–408.
6. Ito Y, Uruno T, Nakano K, et al. An observation trial without surgical treatment in patients with papillary microcarcinoma of the thyroid. Thyroid. 2003;13:381-387.
7. Ito Y, Miyauchi A, Inoue H, et al. An observational trial for papillary thyroid microcarcinoma in Japanese patients. World J Surg. 2010;34:28-35.
8. Ito Y, Miyauchi A, Kihara M, Higashiyama T, Kobayashi K, Miya A. Patient age is significantly related to the progression of papillary microcarcinoma of the thyroid under observation. Thyroid. 2014;24:27-34.

1.3. Confidence intervals need to be used throughout the paper to describe the uncertainty in the findings originating from the use of random sampling. Although they are included in some of the tables, they are largely absent from the abstract, text, and figures.

Response)
As recommended, we added 95% confidence intervals in the abstract, manuscript and figures.

1.4. Could you please reference the world standard of Segi?

Response)
As recommended, we added the reference for the Segi's world standard population.
(reference no.21) (Page 10, Paragraph 1 , Lines 1)

1.5. A number of figures and tables are lacking full descriptions (e.g. details of all statistics plotted on the box plot, denominators for the rates, etc). Please double check that all required details are specified.

Response)
As recommended, we added the detailed description for the figures and tables. We also describe the detail of the statistics and double checked by first authors. e.g.) numerator and denominator for the rates and statistics for the box plots.

1.5. The depiction of mortality rates in Figure 1 is unreadable. The authors might consider using a second scale on the graph given the low mortality rate.

Response)
As recommended, we added secondary vertical axis for mortality rates in Figure 1. It shows changing trends over time more clearly.

1.6. What is the expected time between diagnosis and death for thyroid cancer? Any change in mortality from early diagnosis would not be detectable until this time has passed

Response)
The mortality rate from thyroid cancer between diagnosis and death for thyroid cancer was 2.57 per 1000 person-year. Therefore, the mean expected time between diagnosis and death for thyroid cancer was about 389.1 year in our study.
As you can see in Figure 1, the mortality rate shows a slight fluctuation from 1999 to 2013. However, this slight variation of mortality rate seems to be natural, because the mortality rate itself is very small.
In addition, hazard function for thyroid cancer mortality is stable by period as you can see below figure.

Figure. Smoothed hazard function for thyroid cancer death by follow-up year

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