平成３０年度

愛媛大学医学部一般入試（前期日程）試験問題

外国語（医学科）

（14:10～16:10）

注意事項

（１）試験開始の合図があるまでは、次の頁を開いてはいけません。
（２）解答は、解答用紙の指定のところに横書きすること。
（３）受験番号は、解答用紙１枚ごとに、欄内に算用数字で横書きすること。
（４）問題冊子は、表紙を含めて１０枚、解答用紙は４枚、別紙は表紙を含めて２枚あります。

問題１．次の文章を読み、図を参考にして後の設問に答えなさい。なお「*」の付いた単語は本文の後に語注があるので参考にしなさい。

On 11 March 2011, an extremely strong earthquake, recorded as 9.0 on the Richter scale*, occurred offshore of the northeast Pacific coast, 'Sanriku', of the main island, 'Honshu', of Japan. This earthquake, referred (a) as the Great East Japan Earthquake, triggered a giant tsunami, which was 9.3 meters (b) its highest and caused catastrophic damage to the Tohoku region in northeast Japan. According to the report by the National Police Agency* of Japan as of 9 December 2016, there had been 15,893 reported deaths in 12 prefectures and 2,556 missing persons in 6 prefectures attributed to the disaster. (A), this disaster created one of the worst radiation leakage accidents, which was rated as the 7th (maximum) caution level on the International Nuclear Events Scale* because of the high level of radioactive substances released from the Fukushima Daiichi Nuclear Power Plant (FDNPP). According to the report by the United Nations Scientific Committee* (c) the Effects of Atomic Radiation (UNSCARE), iodine*-131 and cesium*-137, two major hazardous radionuclides*, were released (d) the atmosphere in the ranges of 100 to 500 petabecquerels (PBq) and 6 to 20 PBq, respectively. ①Such a massive and complex disaster inevitably has negative impacts on people's health and daily life.

②Long-term shortages of healthcare resources, as well as regional economic downturn or industry decline, are predictable following such events. Although physicians and medical staff will play an important role (e) reconstructing local health services in the area, it is likely that securing adequate numbers of healthcare professionals may be difficult after such a large disaster. (B), many of the areas affected by the earthquake were medically underserved even before the disaster because they are rural regions. After the earthquake, according to the Japanese media, the situation was reportedly exacerbated*, particularly in areas near the FDNPP, because of damage to infrastructure and radioactive contamination*.(C), one recent study reported changes in the geographic distribution of secondary care nursing staff following the Great East Japan Earthquake. ③In addition, in our previous study, we evaluated physician's characteristics susceptible to migration from the areas surrounding the nuclear power plant, and we found that less-aged physicians in the areas were more likely to decrease than other physicians. (D), we have not studied the overall flow of physicians before and after the disaster. Particularly there is a lack of knowledge about the physicians' migration pattern not only from the areas of nuclear accident, but also from the tsunami-affected areas.

（ E ）, we evaluated the effects of the Great East Japan Earthquake on the distribution of physicians within the most severely affected prefectures (Iwate, Miyagi, and Fukushima). Two major factors in this disaster may potentially impact physician distribution: the tsunami and the FDNPP accident. We obtained individual information about physicians from the Physician Census* in 2010 (pre-disaster) and 2012 (post-disaster). ④We analyzed changes in the number of hospital physicians at varying distances from the tsunami-affected area and from the FDNPP. We examined geographical distributions of physicians in two ways: (1) municipality*-based analysis for demographic* evaluation; and (2) hospital-based analysis for geographic evaluation. In each analysis, we calculated the rate of change in physician distributions between pre- and post-disaster years at various distances from the tsunami-affected coast, and from the restricted area due to the FDNPP accident.

The change in all, hospital, and clinic physicians were 0.2%, 0.7%, and −0.7%, respectively. ⑤In the municipality-based analysis, after taking account of the decreased population, physician numbers only decreased within the restricted area. In the hospital-based analysis, hospital physician numbers did not decrease at any distance from the tsunami-affected coast. In contrast, there was a 3.3% and 2.3% decrease in hospital physicians 0–25 km and 25–50 km from the restricted area surrounding the FDNPP, respectively. Additionally, decreases were larger and increases were smaller in areas close to the FDNPP than in areas further away.

The differences in the distributions of the physicians before and after the tsunami were not substantial. Supportive action from other prefectures may have contributed to the lack of physicians in these areas. However, the number of hospital physicians in areas close to the restricted area surrounding the nuclear power plant decreased significantly, even after adjusting for population decreases. These results suggest a substantial difference in seriousness of the consequences of the two main disasters following the earthquake. Continuous observation is required in the affected areas, particularly near the nuclear power plant that caused radiation leakage.

出典；PLoS One. 2017;12:e0178020. より抜粋，一部改変

［語注］

Richter scale リヒタースケール（地震のマグニチュードを示すスケール）
National Police Agency 警察庁
International Nuclear Events Scale 国際原子力事象評価尺度
United Nations Scientific Committee 国際連合科学委員会
iodine ヨード
cesium セシウム
radionuclide 放射性核種
petabecquerel ペタベクレル（放射性物質の単位）
exacerbate 悪化させる
radioactive contamination 放射性汚染物質
Physician Census 医師に関する調査
municipality 地方自治体
demographic 人口統計学の

［設問１］本文中に使用されている二重線部の付記された単語 a ～ e のうち、アクセントの位置の異なる単語を記号でそれぞれ１つ答えなさい。

(1)	a. extremely	b. recorded	c. occurred	d. catastrophic	e. attributed
(2)	a. leakage	b. substances	c. hazardous	d. atmosphere	e. securing

［設問２］本文中の（ A ）から（ E ）に入る適切な語句を記号でそれぞれ１つ答えなさい。

(A)	a. Additionally	b. Contrary	c. Interestingly	d. Sometimes	e. Usually
(B)	a. Fortunately	b. Furthermore	c. Kindly	d. Nevertheless	e. Perfectly
(C)	a. Excitingly	b. Gradually	c. Indeed	d. Respectively	e. Thereby
(D)	a. Actually	b. Briefly	c. Eventually	d. However	e. Moreover
(E)	a. Ideally	b. Needlessly	c. Obviously	d. Perpetually	e. Therefore

［設問３］本文中の（ a ）から（ e ）に入る適切な前置詞を答えなさい。

［設問４］下線部①は具体的に何を指しているのかを答えなさい。

［設問５］下線部②を日本語に訳しなさい。

［設問６］下線部③を日本語に訳しなさい。

［設問７］以下の文章は、本文中の下線部④に関して、具体的にどのような解析が行われたのかが述べられている。本文および別紙の図を参考にして、下線（ａ）～（ｅ）のうち誤っている下線を１つ選び、訂正しなさい。

まずは、(a) 津波の影響を受けた地域では海岸からの距離を 5km 以内と 10km 以内に分類し、(b)福島第２原子力発電所では立ち入り制限区域からの距離を 25km ごとに分類した。そして、(c) それぞれの分類された地域ごとに震災前後での勤務医数について調べ、勤務医数変化率を算出した。なお、医師の地理的な配置に関しては 2 つの方法、すなわち、(d) 人口統計学的な評価に関しては地方自治体ごと、(e) 地理的な評価に関しては幹線道路（高速道路）で区切った地域ごとで解析した。

［設問８］下線部⑤を日本語に訳しなさい。

［設問９］以下の文章のうち、本文中に述べられている正しいものを１つ選びなさい。

a. 2011 年 3 月 11 日に日本海沖三陸地方に発生したマグニチュード 9.0 の東日本大震災は、東北地方を中心に甚大な被害をもたらした。
b. 警察庁によると 2016 年 12 月現在、東日本大震災による死者および行方不明者は 12 都道府県で 18,449 人に上る。
c. 福島原発事故は、これまでに世界で発生した原発事故としては 7 番目に大きな規模のものであった。
d. 福島原発事故により検出されたヨード 131 とセシウム 137 の基準値を上回る濃度を比較すると、ヨード 131 はセシウム 137 の約 5 倍～80 倍の範囲と考えられる。
e. 東日本大震災で被害を受けた地域は、もともとある程度の医師が確保できていた地域が多かった。

［設問 10］本文のタイトルとして最も適切なものを１つ選びなさい。

a. Decrease of hospital physicians at the tsunami-affected coast
b. Death and missing person in the Great East Japan Earthquake
c. Medical expenditure related to the Great East Japan Earthquake
d. Local distribution of hospital physicians after the Great East Japan Earthquake
e. Damage to infrastructure surrounding the Fukushima Daiichi Nuclear Power Plant

問題２．次の文章を読み、後の設問に答えなさい。なお「*」の付いた単語は本文の後に語注があるので参考にしなさい。

In late October 1948, a dense smog descended over the town of Donora, Pennsylvania. The town was home to a zinc* plant and a steel mill, both run by the United States Steel Corporation. Susan Gnora, a 62-year-old resident of Donora, started to gasp and cough as the smog descended. She died the next day. Dr. William Rongaus, a physician and a member of the board of health, went door to door, treating patients for their respiratory* symptoms and encouraging them to leave town if they could. Many thousands were ill, and at least 20 people died in one of the worst air-pollution disasters in U.S. history. ①The Donora tragedy transformed our perception of smog from a nuisance to a potential killer.

We started to improve air quality with the Clean Air Act of 1963. In 1970, Richard Nixon established the Environmental Protection Agency (EPA) by executive order, and the Clean Air Act was amended to institute National Ambient Air Quality Standards (NAAQS), which set exposure limits for six major air pollutants. (A) the pollutants regulated by the EPA is fine particulate matter — inhalable* particles with an aerodynamic* diameter of less than 2.5 μm ($PM_{2.5}$). Major contributors to $PM_{2.5}$ in the United States include various types of transportation and the coal-fired generation of electricity. Since the 1970s, hundreds (B) articles have been written establishing an association between $PM_{2.5}$ and poor health outcomes, including asthma*, ischemic heart disease*, and all-cause mortality in urban populations. In response (C) these findings, regulators* have lowered NAAQS for ②the allowable amount of $PM_{2.5}$ in the air. Current NAAQS, last updated in 2012, set an annual mean $PM_{2.5}$ level of 12 μg per cubic meter. This standard, which is to be reviewed every 5 years, aims to protect the population, especially those who are particularly sensitive (D) the adverse effects of air pollution, including children, elderly persons, and persons with cardiopulmonary disease*. As communities meet these stricter standards, fewer people will become sick and die as a result of air pollution. A 2011 report from the EPA projected that by 2020, amendments to the Clean Air Act would prevent more than 230,000 premature* deaths, largely as a result of reductions in $PM_{2.5}$ levels. But are current standards sufficient to protect public health*.

Di et al. now report in the *Journal* ③the results of a large study, including more than 60 million Medicare beneficiaries* from the years 2000 through 2012, that addresses the association between annual average levels of $PM_{2.5}$ and ozone, as measured at the ZIP Code* level, and mortality. For every increase of 10 μg per cubic meter in $PM_{2.5}$, there was an

associated 7.3% increase in all-cause mortality. Below the current NAAQS for $PM_{2.5}$ of 12 μg per cubic meter, the data showed that each increase in $PM_{2.5}$ of 10 μg per cubic meter was associated with an even greater increase (13.6%) in mortality. There was no appreciable level below which the risk of death tapered off* — and thus no "safe" level of $PM_{2.5}$. Owing to the large size of the cohort*, Di et al. were able to perform robust* subgroup analyses and identified greater risks of death associated with air pollutants among blacks and Medicaid-eligible populations; moreover, these groups were more likely to be exposed to higher pollutant levels.

The findings of Di et al. stress the need for tighter regulation of air-pollutant levels, including the imposition* of stricter limits on levels of $PM_{2.5}$. Despite compelling data, the Trump administration is moving headlong* in the opposite direction. In March, Trump signed an executive order that lifted a moratorium* on new leases for coal mined* on public and tribal lands and began a process to dismantle* guidelines intended to reduce emissions from coal-fired electricity plants. Earlier this month, he announced his intention to withdraw the United States from the Paris climate agreement. Although these actions were primarily intended to undo efforts made by the Obama administration to address climate change, the potentially dire* consequences also include increasing people's exposure to (　　④　　). In addition, EPA Administrator Scott Pruitt has not ruled out the possibility of revoking* a waiver* included in the 1970 Clean Air Act that allows California to set limits on automotive tailpipe* emissions that are more stringent than national standards; 15 states have adopted California's standards. Revoking this waiver could have the effect of exposing more than 100 million Americans to higher levels of automobile emissions. Trump's proposed budget includes crippling* cuts to the EPA, including cuts in funding for both federal and state enforcement of regulations. ⑤The increased air pollution that would result from loosening current restrictions would have devastating effects on public health.

In explaining his withdrawal from the Paris climate agreement, Trump stated, "I was elected to represent the citizens of Pittsburgh, not Paris." Ironically*, Pittsburgh is less than 30 miles from the Donora Smog Museum, where a sign reads, "Clean Air Started Here." With the report by Di et al. adding to the large body of evidence indicating the risks of air pollution, even at current standards, we must redouble* our commitment to clean air. ⑥If such protections lapse, Americans will suffer and we are doomed to repeat history. Do we really want to breathe air that kills us?

出典；Air pollution still kills. N Engl J Med 376:2591-2592, 2017 より抜粋，一部改変

［語注］

zinc　亜鉛
respiratory　呼吸の
inhalable　吸入可能な
aerodynamic　空気力学上の
asthma　喘息
ischemic heart disease　虚血性心疾患
regulator　（規制の）監督機関
cardiopulmonary disease　心肺疾患
premature　早すぎる
public health　公衆衛生
Medicare beneficiaries　メディケア（米国の医療保障制度）を受けている人
ZIP codes　郵便番号
taper off　先細りになる、小さくなる
cohort　研究対象者集団
robust　強固な
imposition　課すること
headlong　頭から
moratorium　停止、禁止
mined　採掘された
dismantle　取り除く
dire　恐ろしい
revoke　取り消す、解約する
waiver　権利放棄証書
tailpipe　自動車の排気管
crippling　大きな損害を与える
Ironically　皮肉にも
redouble　倍加する

［設問１］（　A　）から（　D　）に入る適切な前置詞を答えなさい。

［設問２］下線部①を日本語に訳しなさい。

［設問３］下線部②は何を目標にして決められているのか。句読点を含めて 50 字以内の日本語で答えなさい。

［設問４］下線部③に示されていることで、正しいものはどれか。記号を１つ選びなさい。

a. $PM_{2.5}$ 濃度とオゾン濃度の年平均値はよく相関していた。
b. $PM_{2.5}$ 濃度が 20 $\mu g/m^3$ の時の全死亡率は 14.6%となる。
c. $PM_{2.5}$ 濃度が現在の基準値内にあれば多少の変動は死亡率に影響しない。
d. $PM_{2.5}$ 濃度は死亡がほぼゼロとなる値に設定しなければならない。
e. $PM_{2.5}$ 濃度の上昇による死亡リスクは黒人でより高い。

［設問５］下線部④に入る適切な言葉はどれか。記号を１つ選びなさい。

a. global warming
b. automobile emissions
c. particulate matter
d. tribal lands
e. strict regulations

［設問６］下線部⑤を日本語に訳しなさい。

［設問７］下線部⑥の意図する内容について、本文に書かれている米国の過去・現在・将来の状況を踏まえて、句読点を含めて 150 字以内の日本語で説明しなさい。

平成３０年度

愛媛大学医学部一般入試（前期日程）試験問題

外国語（医学科）
別　紙

注意事項

試験開始の合図があるまでは、次の頁を開いてはいけません。

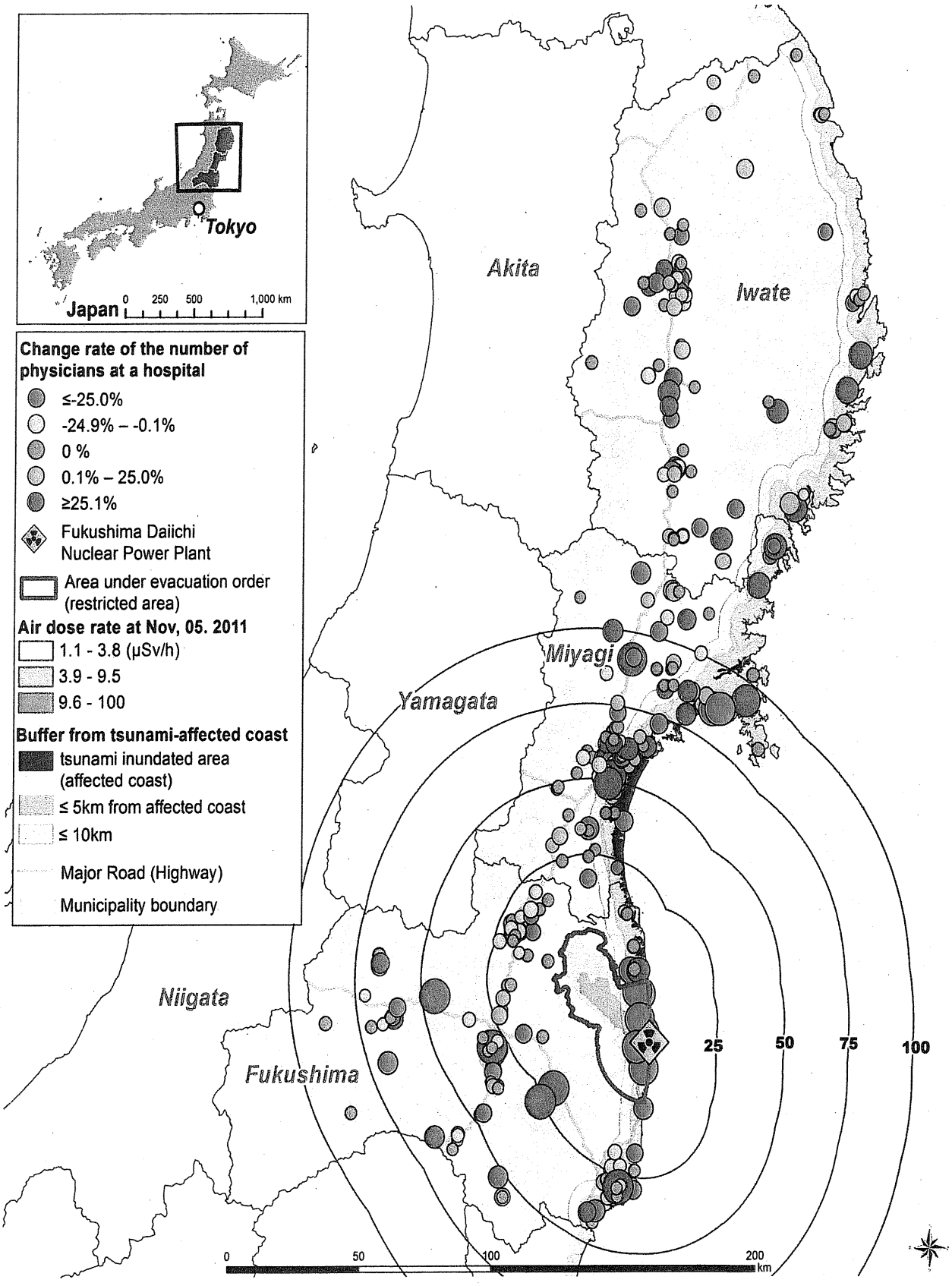

Fig 1. Map showing the geographical characteristics of disaster area and the change rate of physicians. The size of the symbol for change rate represents the magnitude of the change. Air dose rate was measured within 80 km of the nuclear power plant and data were acquired from the Japan Atomic Energy Agency.